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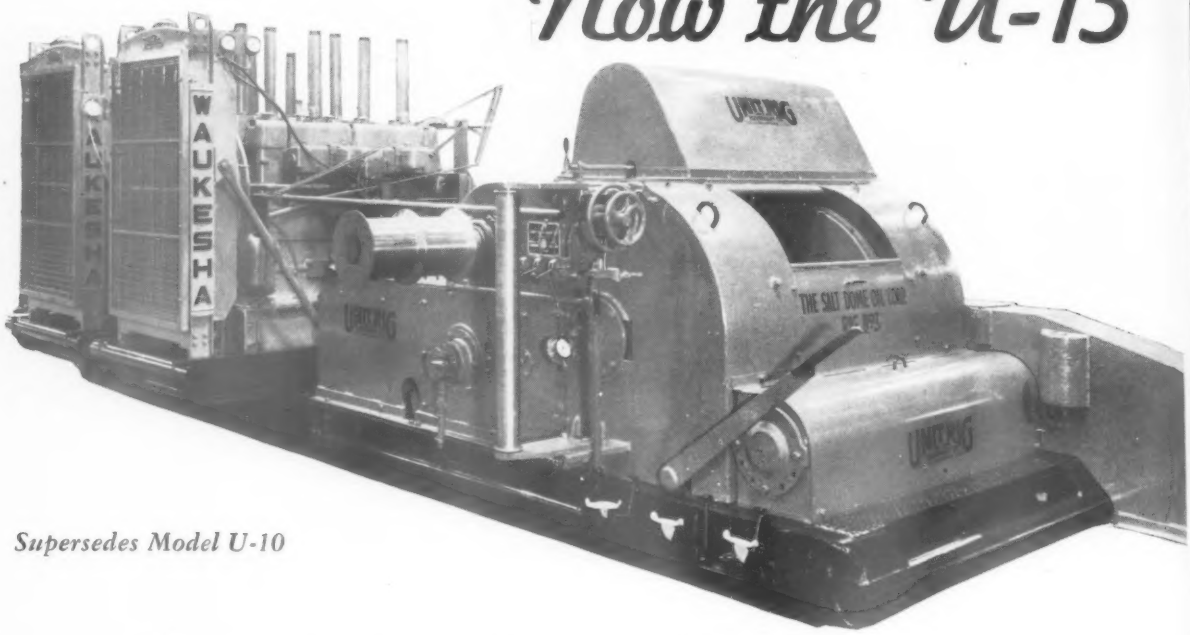

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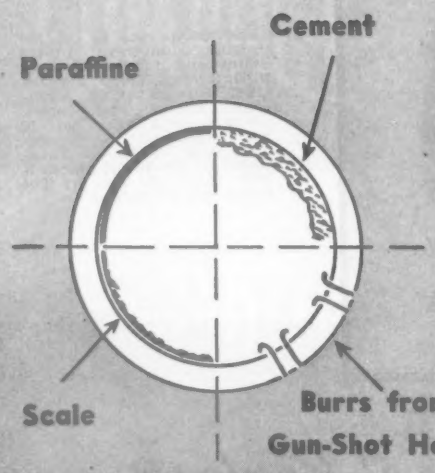

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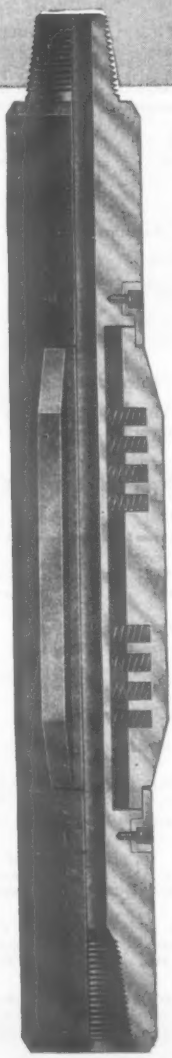

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BAKER OIL TOOLS, INC.

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Trends

Crude-Oil Production
By States—Page 180

CRUDE-OIL STOCKS 218,894,000 bbl. as of February 10—down 2,780,000 bbl. One year ago 238,206,000 bbl.

GASOLINE STOCKS 92,455,000 bbl. as of February 10—up 1,421,000 bbl. One year ago 81,878,000 bbl.

RESIDUAL FUEL-OIL STOCKS 48,845,000 bbl. as of February 10—down 1,606,000 bbl. One year ago 52,419,000 bbl.

GAS OIL AND DISTILLATE STOCKS 30,544,000 bbl. as of February 10—down 1,826,000 bbl. One year ago 35,121,000 bbl.

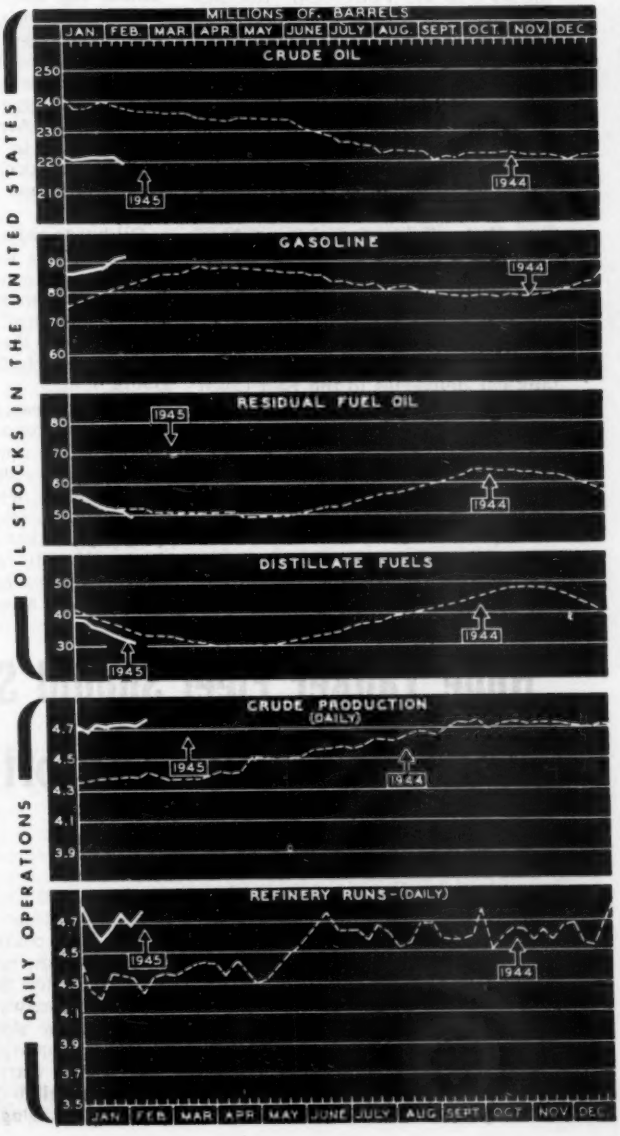
CRUDE OIL PRODUCTION 4,769,000 bbl. as of February 17—up 46,800 bbl. One year ago 4,387,435 bbl.

REFINERY RUNS 4,770,000 bbl. daily week ended February 10—up 108,000 bbl. One year ago 4,276,000 bbl.

A FEW months ago most of the 450 operating refineries in the United States had plans definitely under way calling for postwar construction varying in costs from several thousand to several million dollars. Collectively they added up the largest peacetime building program in the history of the petroleum industry. Similar plans were being considered for many plants outside the United States. Operators at that time believed their plans would take final form with the European war's end, which was expected before the end of 1944.

THE reversal in the western European front in December, with the accompanying revisions in military and reconversion programs, has caused this refinery planning to be largely shelved. Some are asking whether the refinery construction program will ever be revived on the basis outlined last summer. So far as the military is concerned, stress is placed on increased manufacture of petroleum products from existing facilities. Some additional construction has been approved for the refining of high-octane aviation gasolines and other products, and should the European war not end in the near future the building of entirely new units will be sought. There is the further fact that the manpower and materials situations have tightened.

SO far as the refinery program generally is concerned, those in closest touch with it are in agreement that there have been no fundamental changes in the outlook which point to large-scale construction as war conditions, including manpower and materials, justify. Without exception, refiners have the problem of replacements in plant facilities brought about by minimum repair and maintenance over the past 3 years. With few exceptions plant owners are also desirous of modernizing their refineries to conform with the assured postwar requirements in product specifications and plant operating efficiency. In most cases this involves the installation of new cracking and fractionating equipment, together with other plant facilities which have been substantially improved in design since the start of the war. Major postwar construction plans include some of the largest refineries where most of the war-product units are located. In these cases new processing units are needed to round out existing plant facilities.



Record Coastwise Tanker Movement Aids Eastern Supply

Accelerated Water Transportation Timely Because of Diminished Tank-Car Shipment

WASHINGTON.—Relaxed censorship on coastwise petroleum movement last week disclosed that tankers delivered a wartime-record volume of 570,910 bbl. daily to East Coast ports during the week ended February 3. No comparative statistics were available on tanker shipments but the Petroleum Administration for War said that the record ocean movement "kept many cities and towns from running completely dry when overland transportation facilities to the Atlantic Seaboard were crippled by severe snow storms and cold weather."

Ocean going tankers delivered more oil to the East Coast during the week ended February 10 than in any similar 7-day period since April 1942 when a bulk of the U. S. petroleum fleet was requisitioned by the War Shipping Administration to supply the British.

The record tanker movement assumed greater significance because tank-car deliveries to the East Coast fell to a new 3-year low for the second successive week with discharge of 425,155 bbl. daily at eastern terminals for the week ended February 10.

Last week, comparatively mild weather in the Midwest and in most of the eastern states enabled the railroads to relieve the congestion that tied up rail traffic. Through tank-car trains making the long hauls from the Midwest and Southwest are beginning to move without interruption through Buffalo, Pittsburgh, and other gateways to the Atlantic Seaboard.

The backlog of tank cars stranded in terminals west of Detroit and Toledo has been cleared.

However, blizzards in New England continued to retard tank-car shipments into that area. Even local tank-truck deliveries were slowed down or stopped altogether. State militia and Army personnel were called upon to help dealers move supplies to consumers who otherwise would not have received any fuel oil.

Oil barge shipments still were tied up by ice last week, but during the last few days mild weather began thawing out many of the ice-locked ports. Oil traffic is expected to move within the next few days up the Ohio, Hudson and Potomac rivers.

In a few areas, particularly in New England, kerosene consumption skyrocketed to unprecedented levels. Investigation showed that some dealers either were selling kerosene to consumers for use in home fuel oil burners that normally use distillate (No. 2) heating oil or were blending kerosene with home-heating oil to get a lighter grade of fuel.

Huge Tanker Fleet Should Stimulate Postwar Petroleum Export Trade

by N. O. Fanning

NEW YORK.—The large surplus of ocean-going oil tankers which is expected to exist at the end of the war should prove a powerful stimulus to foreign trade in petroleum products, according to observers here. They say that indications point to there being close to 1,000 tankers of some 13,000,000 deadweight tons under American registry at the end of the conflict, compared with 366 tankers of 4,282,100 deadweight tons as of September 1, 1939. Of course some of these new American registry tankers may be redistributed among Allied countries after the war, but this should still leave the American fleet at a record in capacity.

Before the war, the world tanker tonnage totaled 1,507 ocean-going vessels with an aggregate of 16,008,300 deadweight tons. In view of the large increase in American tanker construction it seems likely the postwar tonnage will be as large, if not larger. But the most interesting factor is the relatively greater American tonnage compared with the prewar period.

Some recent discussions of the outlook for the postwar foreign oil trade of the United States have been pessimistic, based on expectations that the foreign demand for oil could be more readily and cheaply supplied from such sources as South America and the Middle East. Students of the international transportation situation point out that the disposition of American registry tanker tonnage may have much to do with the course of the postwar foreign oil trade, and at the same time emphasize that the United States may find itself in the best position in its history, from a transportation standpoint, to supply foreign petroleum requirements.

The question has also been raised, in connection with prospects for America's postwar foreign oil trade, as to the adequacy of domestic oil supplies. Reports have been rather widely circulated of very sharp cutbacks in American oil production in the postwar period. Such cutbacks, it has been said, would be forced by reduced foreign markets and competition from low-cost oil produced both in South America and the Middle East. The possibility also has been mentioned that American fields cannot continue to maintain their wartime production rate in the postwar period owing to natural declines in capacity of some producing areas. However, supposing American oil fields are able to supply immediate postwar domestic oil requirements plus a certain proportion of foreign oil needs, the tankers apparently will be available for that purpose.

A Major Problem

Having in mind the above situation, the postwar disposition of United Nations tanker tonnage becomes a major problem which will profoundly affect the course of the immediately postwar international petroleum trade, according to students of the situation. Before the war the American tanker fleet was second in size to that of Great Britain, with the Norwegian fleet third. Individual nations are in a position to direct the course of their own fleets, and the amount of tonnage at their disposal has been a factor in foreign trade through the ages.

In 1938, exports from the United States of the principal petroleum products totaled about 102,000,000 bbl., a daily average of approximately 280,000 bbl. Exports of crude oil totaled 77,000,000 bbl., or

about 210,000 bbl. daily, bringing the total oil export trade to 179,000,000 bbl. or 490,000 bbl. daily.

According to present indications, there will be no foreign market for American crude oil in the immediate postwar period. Caribbean refineries can be fully supplied from South American producing countries, while European refineries apparently are not expected to be in full operation for at least a year after the end of the war. Near East and Far East refineries could be supplied from the Middle East oil fields.

On the other hand, most foreign markets for petroleum products should be substantial immediately after the war, at least potentially. When these markets can be supplied will depend on the speed with which the war activities can be converted. Most foreign nations are starved for oil at present, and are anxious to obtain supplies as soon as possible. American refineries will have the capacity to supply these export requirements in addition to domestic needs.

America will have the tanker tonnage after the war to handle a record export trade. If United States postwar export oil trade reaches the low point predicted by the more pessimistic it will be for some reason other than transportation capacity.

Whittling-Down Process Continues Against German Oil Supply

WASHINGTON. — Only four of Germany's synthetic-oil plants are operating, and one of these was bombed this week, according to information received from Paris, Supreme Headquarters, Allied Expeditionary Force. All her crude-oil refineries are out of commission. Of 81 major oil targets when the Allied bombing program opened last April, 23 were synthetic plants and 58 were natural-oil refineries. A total of 450 attacks have been made on these targets by American and British bombers. It is reported authoritatively that the Germans now are producing only 103,000 tons of gasoline monthly, in contrast with the 500,000-ton output early in 1944.

The four synthetic plants believed to be operating are at Bohlen, Ruhland, Madgeburg and Merseburg, where the huge Leuna plant is located.

Russian armies in the east and General Eisenhower's forces in the west have captured 36 of Germany's major refineries and synthetic oil plants in their two-way squeeze on the Reich.

Among the plants reported captured by the Russians were those at Czechowice, Trzebinia and Oswiecim in Poland and at Odertal (Deschowitz) in Silesia. Two plants at Blechhammer in Silesia were neutralized. The plants captured by the Allies were not specified.

Damage Not Repaired

The Germans are running out of tools and equipment to rebuild plants. No effort has been made to repair some of the damage. Material salvaged from one bombed plant has been used to patch up another.

A captured telegram from Dr. Albert Speer, German production minister, to Martin Mormann, Hitler's deputy, said the successful prosecution of the war depended upon reconstruction of synthetic oil plants and natural-oil refineries.

Speer informed Mormann that his ministry was "in the process of setting up underground installations, more especially for aviation gasoline," and also was developing small crude-oil processing units that would be safe from air attack. Best Allied opinion, however, is that it is too late for the Germans to hide an effective proportion of their oil-production facilities.

Following a conference in Berlin presided over by Hitler a German economist was directed to undertake the rehabilitation of the bombed-out gasoline production facilities and to conserve gasoline supplies. This program received priority above U-boat and aircraft construction.

Job Not Yet Completed

The economist did his job well. Allied plans had counted on destroying German gasoline production entirely in 6 months. After 9 months the job has not yet been completed but there are signs that German capacity to restore and maintain production facilities is dwindling.

Nazi hopes of regaining sufficient power in the air to halt the bombing attacks are discouraged by the fact that American pilots and gunners are shooting down inferior German pilots at a rate of 16 to 1 on their best days. The inferiority of the German pilots is due in part to lack of gasoline for adequate training.

The shortage of oil has forced a reduction in the number of vehicles allotted to an army and reduced mobility of the ground forces when in action, besides limiting the effectiveness of the Luftwaffe and the U-boats

It is not to be presumed, however, that the Germans will not be able to muster gasoline for a counter-offensive now and then. Their production prior to the Allies' bombing offensive was greater than their needs and reserves were accumulated.

Allowable Transfer at East Pauls Valley Granted

OKLAHOMA CITY.—Transfer of allowables to low gas-oil ratio wells in the East Pauls Valley field, Garvin County, was authorized here last week by the Oklahoma Corporation Commission, provided specified operating conditions are met. There are five possible sources of supply, the commission found, including Upper Pennsylvanian, Lower Pennsylvanian, Viola lime, Bromide and McLish.

Gas oil ratios in the field vary from approximately 200 cu. ft. per barrel to about 8,000 with an average of 2,600 cu. ft. to the barrel.

Operators of leases containing two or more oil wells in the same producing formation may transfer all or a part of the allowable from high gas-oil ratio wells to any other well on the same lease provided that the one to which allowable is transferred has a gas-oil ratio of at least 2,000 fewer cubic feet per barrel than that from which the allowable is transferred.

The allowable-transfer order was issued on application of Ohio Oil Co. which owns approximately 62 per cent of the productive acreage so far proven in the East Pauls Valley pool. Operators in the field, the commission was informed, are considering installation of a pressure-maintenance program.

California Receiving 100,000 Bbl. Outside Oil

LOS ANGELES. — Provision of higher subsidy incentives to California producers to negate current shipments of 100,000 bbl. per day of Texas and Rocky Mountain crude oil to the Pacific Coast was recommended here this week. Edwin W. Pauley, president of the Petrol Corp., Los Angeles, and treasurer of the Democratic national committee, said that current shipments of 100,000 bbl. per day are costing approximately $2 per barrel.

Pauley asserted that higher subsidies to stimulate California production to a point at which current rail shipments from outside producing states could be eliminated would save money, manpower and rail facilities.

FPC to Start Gas Hearings May 1 at Kansas City

WASHINGTON.—First public hearings in the Federal Power Commission's investigation of natural-gas conservation and utilization have been scheduled in Kansas City, starting at 10:30 a.m., May 1. The place of hearing and the rules and procedure for its conduct will be announced shortly, the FPC announcement stated.

The order follows an analysis of the responses received from interested parties following the institution of the investigation, coupled with the views and suggestions which have been presented by representatives of principally interested groups during informal conferences with representatives of the commission. The responses and conferences, the order states, "indicate that it is advisable to hold public hearings in the principal gas-producing regions in order to provide greater opportunity for participation in such hearings with a minimum of travel." The conservation authorities of several states, the order adds, have in preparation statistical and other information which they desire to submit in the investigation.

Procedure for participation in the hearings is provided in the order, which states: "All persons desiring to participate in such hearings shall file with the commission at least 30 days before the date set for the hearing at which they desire to appear a written request, containing a brief synopsis of the evidence they desire to present."

To Probe Waste

The hearings starting in Kansas City are in furtherance of the investigation instituted September 22, 1944, by the commission on its own motion into the extent and probable life of the nation's natural-gas reserves; present and prospective measures for preventing waste and prolonging the life of such reserves; the present and probable future utilization of natural gas for domestic, commercial, and industrial purposes; the extent, character and results of the competition of natural gas with other fuels; and such related matters as may be helpful in the administration of the Natural Gas Act or in determining what additional legislation, if any, should be recommended.

The time and place of other public hearings, the commission said, will be fixed by subsequent orders.

Thus, the FPC rejected recommendations from numerous trade associations and industrial leaders who had suggested that the natural-gas investigation should be deferred until conclusion of the war. The Petroleum Industry War Council objection was among the most recent protests filed against the FPC proceedings in the natural-gas investigation. PIWC asserted by resolution at its January meeting that the FPC investigation will interrupt the war service of numerous technical men whose talents are needed in meeting military demands on the petroleum industry. The council also expressed fear that interference with natural-gas production might hamper withdrawal of crude oil which is required in constantly increasing volume in expanding military operations. The point was made in the PIWC resolution that production of large volumes of natural gas jointly with crude oil is unavoidable, either in solution or as the drainage force in the operation of oil fields.

Threat in Hearing

The possibility that FPC may recommend new regulations to Congress controlling the end use of natural gas is the most alarming threat behind the investigation, according to the analysis of events by leaders in the oil industry. The threat is seen that legislation preventing the utilization of gas, except for specified consumption, would force cessation of crude-oil production in numerous fields and vastly retard development of new discoveries. New fields, it is pointed out, seldom attain sufficient gas volume to attract pipe lines serving the higher grade markets until at or near the crest of exploitation. If gas production is regulated by rigid rules setting up select markets, oil operators see the future probability that field development would be retarded indefinitely.

Most concerned in the entire FPC program, of course, are the natural gas transmission and producing companies. It is conceivable, gas industry leaders assert, that substantial portions of investments in interstate pipe lines would become valueless if FPC or some similar agency were granted power to determine where and for what purposes natural gas could be sold.

The FPC, on the other hand, argues that its investigation is intended to develop facts and is not proposed as a means of capturing regulatory powers currently vested in the individual states. Alarm within the industry, in fact, recently prompted Basil Manly, FPC chairman, to explain that the commission has been urged by certain factions to arrest the inferior uses of natural gas.

Obviously, Manly referred to the attitude of numerous producing states, symbolized by Louisiana's fight against expansion of pipe-line facilities for export of natural gas from that state.

Several Texans, including D. E. P. Schoch, professor of chemical engineering, University of Texas, long have opposed expansion of interstate gas-transportation facilities drawing on fields within that state. Strong opposition was narrowly overcome in the early stages of constructing the Tennessee Gas & Transmission Co.'s 24-in. line from Corpus Christi, Tex., to Cornwell, W. Va.

Dr. Schoch, for example, would prohibit utilization of natural gas by large consumers (such as 100,000,000 cu. ft., or more, per year) for purposes for which lignite or other cheap solid fuels are available. He advocates a gradual increase in the field price for natural gas to 10 cents per 1,000 cu. ft. and institution of an industrialization program in Texas, using the state's natural-gas resources as the chief incentive either as fuel or as raw material. The professor also urges special technical study of natural-gas consumption represented by carbon-black plants, "common carrier" pipe lines and oil lifting with the view of reducing unprofitable or wasteful uses.

New Spacing Regulations In Oklahoma and Kansas

CHICAGO.—An optional spacing pattern for the New Garber field in Oklahoma and new regulations on spacing patterns for the Chase and Williamson fields in Kansas were announced by the Petroleum Administration for War.

In the New Garber field, Townships 22 and 23 North, Ranges 3 and 4 West, wells may be drilled in the center of a quarter-quarter section, or in the northwest quarter of a quarter section, or in the southeast quarter of a quarter section.

A 40-acre zonal spacing is permitted in the Williamson field of Russell County, Kansas, which allows two wells to be drilled in the same quarter-quarter section, provided they produce from different pays. Wells must be drilled either in the northeast or southwest quarter of a quarter-quarter section.

A 20-acre spacing pattern is permitted in the Chase field, Township 19 South, Ranges 9 and 10 West, Rice County, Kansas.

THIS WEEK

TRANSPORTATION—Wartime record coastwise tanker movement of 570,910 bbl. daily disclosed. . . . Cushioned eastern shortages caused by depression of tank-car capacity. . . . Encouraging note is that tankers and military supplies have reached point permitting even temporary diversion of vessels to civilian operation. . . . ¶Tank cars again moving through major eastern terminals but much work remains to normalize overland shipments. . . . ¶More rail facilities made available for moving West Texas crude oil to eastern seaboard. . . . ¶Shipments of naphtha and natural gasoline into District 1 will require PAW clearance after March 1. . . .

PRODUCTION—Texas' March quota boosted to new peak of 2,316,000 bbl. daily, up 26,000 bbl. from February. . . . PAW specified that 20,000 bbl. of the increase should come from West Texas, remainder from new natural-gasoline and cycling plants. . . . ¶California crude output climbs above 900,000-bbl. daily figure. . . . ¶National certification of 5,118,760 bbl. daily next month sets new all-time high, up 43,910 bbl. . . .

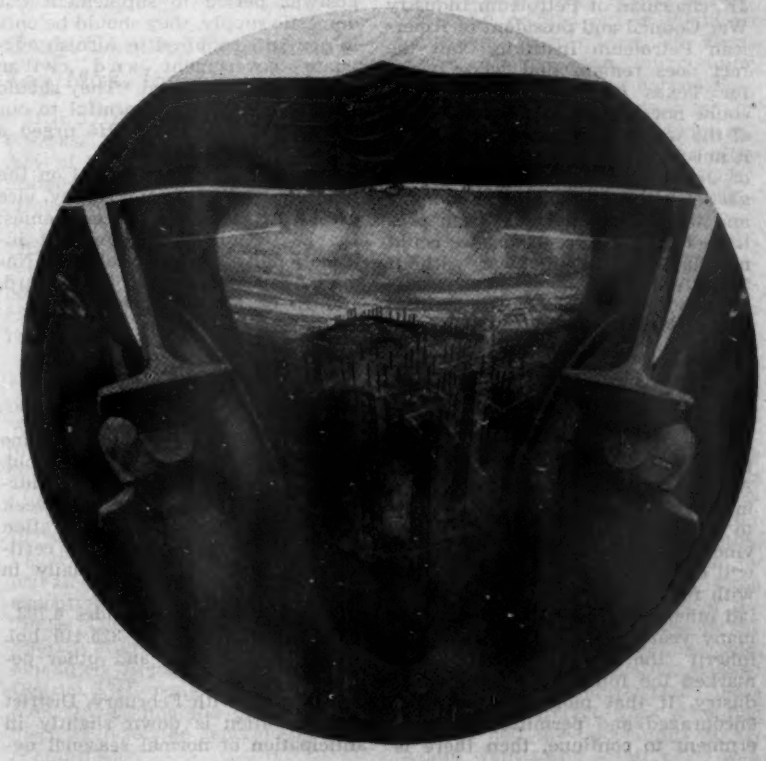
REFINING—Industry capable of producing 300,000 to 400,000 bbl. per day of superfuel for B-29's when European action ends. . . . Until Nazis fall, stress is divided between quantity and quality. . . . Full skill and all equipment can concentrate on quality alone in final Pacific blows. . . . ¶First pentane isomerization unit, part of more elaborate aviation-gasoline plant, starts operation on Pacific Coast. . . . ¶William R. Argyle made associate director of PAW's refining division and Bonner Barnes, Gulf Oil Corp., appointed assistant director. . . .

NATURAL GAS—Federal Power Commission sets first hearing on national conservation and utilization for May 1, at Kansas City. . . . Formal procedure outline to be issued shortly. . . . Starting date for hearings signals rejection of PIWC's suggested postponement until war ends. . . . ¶Dr. E. P. Schoch, Texas University, continues fight against further increase in natural-gas exports. . . . Proposes minimum price of 10 cents per 1,000 cu. ft. in the field, rejection of demands where inferior fuels are available. . . .

DRILLING—Completions make upward move, perhaps ending start-of-year slump . . . Seven weeks' total this year is running 33 per cent ahead of 1944. . . . Eastern states, Texas, California and Oklahoma contribute most of gain. . . .

MATERIALS—Second quarter outlook still uncertain. . . . War's progress certain to influence final steel allocations, perhaps unwittingly, but nevertheless a weighty factor. . . . Military pressure for maximum allotment is irresistible when the war news is bad, eases when the going is better. . . . ¶Final WPB allocations due next week, although changing events may cause further delay.

INTERNATIONAL—Government and industry conference on Anglo-American oil treaty under way. . . . International oil pact high on list of White House economic recommendations. . . . Congressional action urged by president, following Yalta Big Three conference. . . . Assumption inescapable that Churchill and Stalin gave tacit approval to Roosevelt's economic program. . . . Lifting of trade barriers one of proposals—could result in changed petroleum-import policy. . . .



Probably the most unusual picture ever painted of any American oil field is this air view of Signal Hill (California), decorating the bow of a new tanker launched recently at Marinship Corp.'s Sausalito shipyard. The picture is 15 ft. high and more than 12 ft. wide on the curving bow of the 523-ft. ship. The SIGNAL HILLS was the seventeenth of a fleet of 41 tankers of 8,250 hp., comprising the "Hills" class. Each is named for an important California oil field by taking the key word from the name of the field and adding the class name "Hills." Signal Hill, known during recent years as Long Beach, has produced nearly 705 million barrels of crude oil, leading all California reservoirs in cumulative output

Texas' Effort Praised, Price Regulations Flayed, at Dallas

DALLAS.—It is an outrage that the producers of oil are required to supply this tremendous demand at a price far below the cost of replacing the reserves, declared Maston Nixon, president of the Texas Mid-Continent Oil and Gas Association, at a dinner given in the Baker Hotel February 15 by First National Bank in Dallas for leaders in the oil industry.

"To have a healthy industry that will be prepared in the future for the nation's defense as we have been in the past," Nixon told the 400 guests, "we must be unshackled and have a price that will provide incentive to find more oil that may be developed under our system of proration, and to provide for high rates of production in time of great need. The oil industry should free itself of any wartime subsidies. It cannot be free and at the same time accept dollars from the federal Government. One cent per gallon increase in gasoline with a 35-cent average price raise for crude should be placed in effect at once to partially correct the great injustice that has been done the industry."

"Of course every oil state is doing its level best," said William R. Boyd, Jr., chairman of Petroleum Industry War Council and president of American Petroleum Institute, "but the fact does remain that were it not for Texas oil, the United States could not be fighting on two sides of the world at the same time. Were it not for Texas oil, either Germany or Japan would have had time to get set within its conquered domains and the war would have been prolonged indefinitely. In fact we could not have fought this war without Texas oil.

Able Leadership Lauded

"No one need fear for the future of the petroleum industry in Texas and elsewhere so long as there are wise and able men to lead the way and the leadership is not hogtied by needless political interference. And, our right to survive as a free industry depends upon our ability to provide leadership. I am convinced that the oil men of the future will continue to supply this country with fuels, lubricants, and the myriad other products of petroleum for many years to come, provided they inherit the pioneer spirit that marked the founders of the oil industry. If that pioneering spirit is encouraged and permitted by government to continue, then there is no need to fear any shortage of oil."

The importance of the wildcatter was emphasized by Russell B. Brown, Washington, general counsel for Independent Petroleum Association of America. "The success of the wildcatter," he said, "has resulted in enduring benefits to each community and the nearby areas where petroleum has been found. A part of the wealth of every barrel of oil produced in the United States remains in the areas of its production. Thus, we have prosperous communities in every oil state. Such is not the case in countries where oil rights are retained by the central government and apportioned out through concessions to oil-exploration groups which transmit the benefits of their successful petroleum operations to such world financial capitols as London, New York or Amsterdam."

Ralph T. Zook, Bradford, Pa., president of Independent Petroleum Association of America, said the security and wellbeing of the United States demand that industry and government set to work earnestly and intelligently to encourage the finding and development of crude-oil reserves.

"If imports are necessary in the postwar period to supplement our domestic supply, they should be only in amounts required to furnish adequate government and civilian needs," Zook declared. "They should not be in quantities harmful to our domestic oil industry." He urged a higher price for crude oil.

The bank was represented on the program by Eugene McElvaney, vice president, as master of ceremonies; Dr. E. DeGolyer, director and internationally famous geologist; Nathan Adams, chairman of the board, and E. L. Flippen, president.

All-Time Production Peak Certified for March

WASHINGTON.—A new all-time record production of 5,118,760 bbl. daily of all petroleum liquids during March was certified this week by the Petroleum Administration for War. This compares with certification of 5,074,850 bbl. daily in February.

The March figure includes 4,793,350 bbl. of crude and 325,410 bbl. of natural gasoline and other petroleum liquids.

Compared with February, District 1 certification is down slightly in anticipation of normal seasonal decline in natural-gasoline production. District 2 is up 1,150 bbl. daily, representing an increase of 3,000 bbl. in Oklahoma crude and decrease of 1,850 bbl. in natural gasoline. District 3 is up 28,800 bbl., mostly in Texas and including 3,000 bbl. natural gasoline from new plants in Louisiana. District 4 is unchanged. California is up 13,550 bbl. of crude and 810 bbl. of natural gasoline and condensate.

PAW Restricts Naphtha and Natural Shipments to East

WASHINGTON. — Movements of naphtha and natural gasoline into Petroleum Administration for War District 1 by rail or barge will require approval of PAW under an order effective March 1. The explanation was that unscheduled shipments of liquids suitable for blending into motor fuel have resulted at times in an unbalanced distribution of motor fuel in the eastern states.

Faulkner Made Gulf Refinery Superintendent

PORT ARTHUR.—R. C. (Dick) Faulkner of Port Arthur has been appointed superintendent of Gulf Oil Corp.'s refineries in Texas.

Faulkner, former assistant general superintendent, succeeds Bonner H. Barnes, who has assumed his duties as assistant director of refining, Petroleum Administration for War, Washington, D. C.

The announcement, made by T. J. Sullivan of Pittsburgh, Pa., Gulf's general manager, named three assistant general superintendents of Gulf plants in Texas as G. I. Roberts, T. F. Hogan and L. O. Crockett, all of Port Arthur.

BONNER H. BARNES

HINES H. BAKER | DAVID FRAME | H. W. FERGUSON | C. E. REISTLE, JR.

Several Changes Are Made in Humble's Official Family

HOUSTON.—Hines H. Baker, who joined Humble Oil & Refining Co. in 1919 as a member of the legal department, was elected executive vice president, a new post, at the annual meeting of directors last week. David Frame, who joined Humble in the same year as a scout, was made vice president in charge of production. At the meeting of stockholders Harry W. Ferguson, since 1941 manager of refinery operations, was elected a director.

In addition to these changes in Humble's official family Carl E. Reistle, Jr., was promoted from chief petroleum engineer to general superintendent of the production department. His former post was filled by promotion of Bowman Thomas, previously Reistle's assistant.

Baker has been a member of the board of directors since 1937 and for the past 4 years has been vice president in charge of refining and sales. He received his A.B. and LL.B. degrees from University of Texas and he served as a lieutenant of artillery in World War I.

Frame was superintendent of several of the company's production divisions before he was promoted to general superintendent of production, with headquarters in Houston. He has been a director since 1941. He was a captain of artillery in World War I.

Ferguson joined Humble in 1924 as a chemical engineer at the Baytown refinery. He was moved to the Houston office in 1933 as assistant manager of technical research work. Four years later he was made assistant to the manager of the refining department and then a member of the manufacturing committee.

Following his graduation from University of Oklahoma with a degree in chemical engineering in 1922 Reistle joined the Bureau of Mines at Bartlesville, Okla. He remained with the bureau until 1933, devoting his attention chiefly to oil-production problems. Bowman, who graduated in petroleum engineering from University of Oklahoma in 1929, was employed by Humble as a junior petroleum engineer. He became assistant chief petroleum engineer in 1940.

Gray, General Committee's Key Man, Joins Humble

HOUSTON.—David G. Gray, for the past 2½ years executive secretary of the industry's general committee for District 3, Petroleum Administration for War, joined Humble Oil & Refining Co. February 15. Charles F. Roeser, chairman of the general committee, said Gray would continue to discharge the duties of executive secretary until other arrangements are made.

Gray entered the oil purchase division of The Texas Co. in 1915, saw 2 years oversea service in World War I and in 1925 became vice president and later president of Dale Oil & Refining Co., Wichita Falls. From 1931 to 1935 he was manager of producing and refining operations for Waggoner Refining Co. of Electra, Tex. Later he engaged in private drilling operations, and was executive vice president of North Texas Oil and Gas Association. Shortly after Pearl Harbor, he was appointed director of marketing for District 3. He resigned that appointment to assume the duties he has discharged for the general and other committees.

Prospects Held Bright For Postwar Aviation

NEW YORK.—A bright prospect for aviation in the immediate postwar period was forecast last week by Charles I. Stanton, deputy administrator of the Civil Aeronautics Administration, in connection with the dedication at Purchase, N. Y., of the new airport of North American Airport Corp., subsidiary of the Gulf Oil Corp.

Stanton predicted that the new airport, which will be opened for public service at the end of the war, would be a stopping point for domestic airplanes en route to and from Cleveland and Boston to New York, and pointed out it would be convenient to residents of Westchester County and surrounding areas for private flying purposes.

He said there might be 350,000 or more private airplanes in the United States within 5 years after the close of the war, and that perhaps 40,000 of these would probably be in the New York area.

A large party attended the dedication ceremony at the air field, despite a raging snow storm, but actual flight plans had to be abandoned because of weather conditions. Herbert C. Gerlach, Westchester County Supervisor; Milton N. Weir, assistant to the president of the Gulf Oil Corp., and Edward C. Rowe, president of the North American Airport Corp., were among those officiating, but Stanton was delayed in arriving.

A large flying population after the war was predicted by Stanton, who said that he felt there would be 3,000,000 or more trained in some phase of aviation by the end of the war, including ground forces in the service. The armed forces, he said, would release about 500,000 trained flyers and that thousands of those engaged in aircraft work who had not yet had the opportunity to fly would want to do so after the war.

White House Urgency Note May Speed International-Oil Pact

WASHINGTON. — Representatives of Government and the oil industry met with the Senate foreign relations committee February 15, at the invitation of Sen. Tom Connally, Texas, for informal discussion of the proposed Anglo-American oil agreement.

Call for resumption of petroleum-agreement discussions promptly followed a message from the White House outlining several economic problems which President Roosevelt submitted for early consideration in Congress.

Basically, the president asked for measures which will implement economic recommendations from the Bretton Woods conference. He asked specifically for consideration of an international petroleum agreement along with measures dealing with the food and agricultural recommendations of the Hot Springs conference 20 months ago, for a strengthening and broadening of international trade, for a reduction in trade barriers, control of cartels, and an increase in the capital of the Export-Import Bank.

The White House message to Congress was issued almost simultaneously with disclosure that the Big Three had concluded an 8-day conference at Yalta, on the Crimea. Timing of the release of the White House message after the Yalta conference indicated that he had laid the basic principles before the Big Three meeting and that plans had met with general approval, including that part dealing with petroleum.

Must Include All Nations

The revised Anglo-American oil agreement, of course, is the first step toward a truly international petroleum pact. In order to attain international character, Latin-American producing countries, the Netherlands, the Soviet Union, France and other European oil nations must be brought into the agreement.

Telegraphic notice of the meeting was sent by Deputy Petroleum Administrator Ralph K. Davies to members of the national oil policy committee of Petroleum Industry War Council; to William R. Boyd, Jr., chairman of the council, and to Judge Manley Hudson, American member of the Permanent Court of International Justice, who is the industry group's special counsel on the proposed agreement.

Members of the national oil policy committee are: A. Jacobsen, Amerada Petroleum Corp., chairman; O. D. Donnell, The Ohio Oil Co.; J. Frank Drake, Gulf Oil Corp.; William H. Ferguson, Continental Oil Co.; Walter S. Hallanan, Plymouth Oil Co.; George A. Hill, Jr., Houston Oil Co. of Texas; Eugene Holman, Standard Oil Co. (New Jersey); W. F. Humphrey, Tide Water Associated Oil Co.; J. C. Hunter, Mid-Continent Oil and Gas Association; B. Brewster Jennings, Socony-Vacuum Oil Co., Inc.; W. Alton Jones, Cities Service Co.; John M. Lovejoy, Seaboard Oil Co. of Delaware, Inc.; A. C. Mattei, Honolulu Oil Corp.; Joseph E. Pogue, Chase National Bank; Charles F. Roeser, Roeser & Pendleton, Inc.; Robert E. Wilson, Standard Oil Co. (Indiana), and Ralph T. Zook, Independent Petroleum Association of America.

Contract-Settlement Guide Offered to Contractors

WASHINGTON.—A new contract-settlement training guide to prepare war contractors for handling contract settlement has been published by the Contract Settlement Adisory Board's committee on training. The booklet is designed to provide basic information for termination coordination committees, which have charge of local contractor training programs.

The new program, built around a 4-hour course for contractors, marks a departure from previous contract settlement instruction. It gives contractors actual practice in filling out settlement proposal forms and solving practical problems dealing with such subjects as termination inventories, scrap disposal, etc. The new short course is part of the nation-wide program to assist all war contractors to obtain settlement if their war contracts should be terminated.

Wylie Buys Oil Property In Goodwill Hill Area

BRADFORD, Pa. — The Knightlinger oil property in the Goodwill Hill area, owned and operated for the past 16 years by Ralph E. Davis, engineer, of Pittsburgh, has been purchased by Robert Wylie, of Bradford.

The property consists of 266 acres with 140 wells. A partial repressuring operation has maintained uniform production for years. Wylie plans to institute intensive repressuring.

Increases in Price Ceilings Granted for 25 Oil Pools

WASHINGTON. — Increases have been granted in the ceiling prices of 25 oil pools under the stripper-well premium payment plan by Office of Price Administration. The increases, ranging from 3 to 35 cents a barrel, are effective as of February 1. The Government will reimburse first purchasers of the oil for these increases and thus they will not be passed on to the public in the form of higher prices for petroleum products.

Twenty of the pools have been added to the list because investigation has shown the average daily well production was less than 9 bbl. either during December 1943 or during the year proceeding application for inclusion in the plan. Five have been added under a recent extension of the plan allowing increases where the daily average per well production is more than 9 bbl. and where, because of high cost factors, existing ceiling prices were below the average cost of production. Revisions were made in increases previously granted five pools, three upward and two downward. Two pools, Belle Isle and Branch, Louisiana, previously granted increases, were found to be gas fields and have been deleted from the list.

The 25 new pools follow:

Pool and state—	Cents increase
Troy (Nacatoch and Tokio), Arkansas	35
Cooks Mills, Illinois	35
Concord, East,, Illinois	35
Brown, Illinois	20
Laton, Kansas	20
Jennings (Evangeline 0-3,750 ft.), Louisiana	25
Falls City, Nebraska	18
Airport, Oklahoma	35
Beland, Oklahoma	35
Dill, Oklahoma	20
Jolly Patton, Oklahoma	35
Kidd, Oklahoma	35
McLish, Oklahoma	35
Muskogee, North, Oklahoma	35
Naval Reserve, Oklahoma	20
Oklahoma City (Arbuckle lime), Oklahoma	35
Robinson, Oklahoma	35
Twin City, Oklahoma	35
Wagoner, Oklahoma	35
Wagoner, South, Oklahoma	35
Watkins, Oklahoma	20
Johnson, Texas	30
Gayle, Texas	20
Goodrich, Texas	35
White and Baker, Texas	3

The five pools given revised increases, with the previous increases in parentheses, follow:

Pool and state—	Cents increase
Colyer, Kansas	35 (25)
Haller, Kansas	35 (25)
Hensley, Oklahoma	35 (25)
Loco, Oklahoma	20 (35)
Seminole, Northeast, Oklahoma	20 (25)

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

After Victory in Europe

WITH the ending of the war in Europe the petroleum industry will be confronted with the immediate problem of rebuilding oil properties of that continent once valued at hundreds of millions of dollars, along with the task of devising means to provide the initial peacetime product requirements of a half-billion people. The job of bringing order out of chaos will devolve largely on private oil operators.

Peace terms as now projected will not result in boundary changes of major importance in national ownership of producing and refining properties. Poland is a possible exception, with most of its output becoming part of the U.S.S.R. supplies. The prewar crude-oil production of 10,000 bbl. daily, with greater refining capacity, supplied most of Poland's prewar requirements.

Since 1939 little has been known regarding Soviet petroleum developments. The U.S.S.R. is credited with daily crude-oil output of approximately 600,000 bbl. and a refining capacity sufficient to manufacture this crude oil into prewar products. The United States over the past 2 years has supplied the Russians with large quantities of 100-octane gasoline and other war products.

Largely through the assistance of this country, war-product facilities have been installed at several of the Soviet refineries and four plants at new locations are under construction at this time as part of the Allied war program. The government's purchases of drilling equipment have been substantial. It seems reasonable to conclude from developments that the Soviets have a large petroleum expansion planned for the postwar period which will take care of their own increasing needs, but which in the near future will not result in large surpluses for export to adjoining markets.

Romania is the only other European country with petroleum production in excess of national consumption. Its refineries were heavily bombed and salvageable equipment is reported to have been confiscated recently and shipped to Russia by the Soviet Government. American and European owners of the Romanian oil properties will have to make large new investments before production and refining operations can resume the prewar operating level of 125,000 bbl. daily.

Germany, the second largest petroleum market in continental Europe, will come out of the war with its refining and synthetic plants destroyed. Its 20 or more synthetic units constitute a war activity and because they are not competitive with normal petroleum operations they probably will not be rebuilt. With its confiscated properties returned to the countries from which they were taken, Germany, petroleumwise, will start from scratch when peace comes.

The government and private owners who built a new refining industry in France in the thirties and late twenties now have most of the job to do all over again. The same situation prevails in Belgium and some of the other invaded areas. After more than 5 years of war Europe's petroleum facilities, from the fields through the distributing units, including those in neutral countries, will require complete overhauling.

A substantial part of the cost of rebuilding is properly a military charge against the Allied governments. But the responsibility of initiating and carrying through this rehabilitation program, of major importance in world petroleum, rests with the prewar private owners.

Tide Water Associated Dedicates New Fluid Cat Cracking Plant

by L. P. Stockman

LOS ANGELES.—Tide Water Associated Oil Co. formally dedicated its new fluid catalytic-cracking plant at the Avon refinery February 15 before about 1,500 guests and employes and the unit has already gone on stream. Among the guests were S. Belither, vice president of Shell Oil Co., Inc., and H. D. Collier, president of Standard Oil Co. of California.

This new plant, financed entirely by Tide Water Associated, has a design charge capacity of 16,000 bbl. of gas oil per day while running 72 per cent to cracked gasoline and lighter fractions in a single pass through the reactor unit. The ability of the plant to circulate catalyst between the reactor and regenerator vessel is in excess of 40 tons per minute with coke burning capacity in the regenerator in excess of 16,000 bbl. per hour.

The pentane isomerization unit included in the installation is the first plant of its type. The plant synthesizes isopentane, an important ingredient of aviation gasoline, from normal pentane. A liquid catalyst is employed, of which the active ingredient is aluminum chloride. The reaction is controlled by proper use of reaction promoters and suppressors, such as hydrogen and hydrogen chloride.

In the Avon catalytic-cracking unit no furnace is needed for preheating the oil charge. The oil reaches the temperature required for reaction from heat imparted to the moving catalyst in the regeneration step. After combustion, the catalyst at about 1,050° F. or higher temperature flows from the regenerator into the reactor riser pipe where it is contacted with the fresh oil charge which has been preheated to approximately 400° F. through heat exchange. The oil, which is substantially completely vaporized instantly upon contact with the hot catalyst, passes into the reactor vessel where a suitable bed depth of fluid catalyst is maintained. The Avon reactor is unusually large, dimensions of the cylinder portion being 27 ft. in diameter by 54 ft. high on the straight side, which with a 45° cone top and bottom provides ample capacity for maintaining high cracking intensities at design or higher charging rates. Both the reactor and fractionator are alloy lined to permit operation on a variety of feed stocks. At the bottom of the reactor standpipe a slide valve is provided which regulates the flow into the 92-in. regenerator riser pipe. This line has no horizontal sections. The upsweep bend is constructed of bare carbon molybdenum steel, and Insidline construction is used in the vertical section.

The regenerator vessel has an effective diameter of 46 ft. and a cylinder height of 30 ft. after allowing for the space occupied by the Bigelow-Liptak refractory lining. The regenerator vessel also has a 45° cone top and bottom, and is equipped with a Meehanite distributor grid and two regenerated catalyst draw-offs, one for the regenerated catalyst return to the reactor and the other for the recycle catalyst steam generator exchangers, which act as a temperature controller. The flue gases leaving the bed of fluidized catalyst in the regenerator pass through Multiclones and through twin waste heat boilers and into the Cottrell precipitator units which are operated at substantially atmospheric pressure.

In order to augment the supply of virgin gas oil from the Avon distillation units, a vacuum feed preparation unit was built and is operated in conjunction with an existing thermal viscosity breaking unit. The gas-recovery stabilization unit provided for the new catalytic plant processes both the liquid and the gas products from the main fractionating tower. Five 800-hp. Clark compressors take suction on wet gas from the distillate condenser at substantially atmospheric pressure, raising the pressure to approximately 40-lb. gage in the first stage of compression. All facilities were constructed by C. F. Braun & Co. The catalytic-cracking unit is licensed by Universal Oil Products Co. which also furnishes the process engineering design. The pentane isomerization unit is licensed from Shell Development Co.

Pentane isomerizer at Tide Water Associated's Avon refinery

Brockschmidt Leaves WPB To Join Jersey Standard

WASHINGTON.—C. L. Brockschmidt, natural-gas engineer for War Production Board, will leave the board March 1 to join Standard Oil Co. of New Jersey as gas engineer in foreign marketing coordination, with an office in New York. Brockschmidt was one of the first natural-gas engineers to be employed from the natural-gas industry in what is now the gas division of Office of War Utilities. For the past 18 months he has been chief of the supply and allocation section of that division.

Superfuel Capacity to Rise When Nazis Surrender

NEW YORK.—The petroleum industry can produce 300,000 to 400,000 bbl. daily of synthetic superfuel for B-29 requirements and other superior military consumption as soon as the European war ends, easing the demand for peak production. Thus, Dr. Robert E. Wilson, chairman, Standard Oil Co. (Indiana) summed up the industry's vast scientific accomplishments during the war in a radio address February 18 as a part of the New York Philharmonic Symphony broadcast.

Dr. Wilson painted a bright picture of future possibilities for development of hydrocarbon fuels. There are two or three new hydrocarbons which are in some respects as much better than isooctane as isooctane was better than any previous gasoline, Dr. Wilson asserted.

He outlined the growth of 100-octane gasoline production from the first Army order for a tank car load about 1933 to the current output of more than 500,000 bbl. daily. It was the margin of 10 to 13-octane numbers in aviation fuel, Dr. Wilson explained, which enabled the British Spitfires to repulse the German Luftwaffe in the Battle of Britain. The superior military fuel, he said, came almost exclusively from the United States refining industry.

Texas Gives Incentive to Gas Cycling Operations

AUSTIN.—Incentive to return gas produced jointly with condensate or crude oil to the formation from which it originated was increased in Texas last week by a Railroad Commission order applying specifically to Chicago Corp.'s Wardner lease in the Stratton field.

The order permits Chicago Corp. to calculate its gas-oil ratio on a basis of net gas withdrawals. Thus, the producing company is granted credit for gas returned to the reservoir and permits operation of the property although the gross gas production is higher in many instances than the maximum ratio authorized by the Railroad Commission.

The Chicago Corp. agreed to install a low-pressure gathering system for accumulating gas produced from Clyde, Bertram, Wardner and Sellers sand wells in the Stratton field. The gas so gathered, Chicago Corp. assured the Railroad Commission, will be processed for a portion of its hydrocarbon content in the company's Stratton field cycling plant, compressed and returned to its original reservoir. Gas taken into the plant from each respective sand in the Stratton field will be metered separately as to its origin from oil and gas wells.

Gas from 27 wells covered by the order previously had been vented to the atmosphere. Venting practices resulted several weeks ago in a Railroad Commission order shutting in the leases from which, the regulatory body held, gas was being wasted in violation of its gas-oil ratio conservation rules.

Georgia House Passes Bill Creating Oil Commission

ATLANTA.—A bill designed to encourage orderly exploration for oil has been passed in the house by a vote of 108 to 10 and sent to the senate. The measure would create a three-man oil and gas commission appointed by the governor to regulate the drilling of wells and other exploratory work.

The commission would be empowered to name a production engineer, at a maximum salary of $4,000 a year, to make surveys, and to gather borings and cuttings. Before drilling for oil, a person would have to obtain a permit from the commission at $25.

West Pampa Repressuring Association Organized

Formal organizational set-up of the West Pampa Repressuring Association was established at the meeting held by the operators at Amarillo on February 15. Representatives of most of the 49 owner-participants and of practically all of the 26 active operators in the program attended.

Elected to the executive committee of the large recovery project, the engineering features of which were described in detail in The Oil and Gas Journal for February 10, were: G. H. Card, chairman, Stanolind Oil & Gas Co.; R. W. Pringle, vice chairman, independent operator; H. H. Kaveler, secretary-treasurer, Phillips Petroleum Co., and J. B. Steele, Kewanee Oil & Gas Co.; H. J. Gibbons, Skelly Oil Co.; D. A. Powell, Drilling and Exploration Co., and C. P. Conover, Cities Service Oil Co.

A report was given by the gas compression service agent, Skelly Oil Co., which stated that final plans for the field-wide injection system, including Girbotol type gas treating equipment and dehydrating units, were virtually completed and that actual construction work would be pushed all possible. The cost of the line system and treaters is being underwritten by the association.

Installation of compressor equipment for the necessary additional boosting of the input gas from present residue pressures is planned for an early date.

Oklahoma Issues New Rules Governing Oil Operations

Following studies and work for more than a year of committees representing the oil industry, the Oklahoma Corporation Commission has completed formal hearings and issued a comprehensive set of new general rules and regulations pertaining to conservation of oil and gas.

Historically, in 1917, soon after the enactment of the first oil and gas conservation laws in Oklahoma, the commission promulgated general rules and regulations in Order 1299. Later, pursuant to the 1933 conservation law, the commission issued additional rules and regulations covering oil production which have since been amended from time to time.

With much progress in late years in scientific and geological information and enlargement of the conception of oil and gas conservation, the industry's representatives and the commission formed several committees: General, coordination, drilling and development, oil production methods, gas production, secondary recovery and pressure maintenance, plugging and abandoning, transportation and purchase, and legal. The committees held more than 100 meetings to investigate different matters that led to new general regulations. Approximately 16 general meetings were held by the industry, together with the Oklahoma Conservation Department, and after each meeting revised copies of the proposed general rules were sent to the industry for further consideration and discussion. Many geologists and engineers testified in the hearings as to the applicability of the proposals in the prevention of waste and the insurance of obtaining maximum recovery of oil and gas.

The new regulations covering production and conservation of oil and gas in Oklahoma have been adopted and set forth in the Corporation Commission's Order 17528. The Oklahoma regulations covered by the order are codefied under the main headings of: general rules, drilling and development, oil and gas production from oil pools, gas production methods, secondary recovery and pressure maintenance, plugging and abandoning, and transportation, purchasing and reporting. For the purpose of proper interpretation a list of 54 definitions of terms is given.

In the publication issued by the commission on the rules also is given general information and explanation of practice and procedure to be used before the commission on matters relating to conservation of oil and gas, together with nine articles on special cases.

New Peaks Reached in Bids From Drilling Rights on Public Land

WASHINGTON.—All records for the largest amount of money ever offered to the U. S. Government for the privilege of drilling for oil on 1 acre of federal land were shattered twice in the same year, Commissioner Fred W. Johnson, of the General Land Office, reveals in his annual report. Both bids were for land in the Elk Basin field, Wyoming. In August 1943 a bid of $5,800 smashed all previous records. Three months later a bid of $26,216.21—almost five times greater than the earlier one—was made, setting a new all-time high.

Altogether, nearly $3,000,000 was paid to the government during the fiscal year as bonus bids for the privilege of drilling for oil, a profit to the taxpayer which does not take into account the additional rental and royalties from production on lands which accrue to the federal Government under General Land Office lease operations.

The report is one of three submitted by agencies of the Department of the Interior, the others being the Bureau of Mines and the Geological Survey. All show marked evidence of the nation's war activities.

With military requirements dipping deeply into the Nation's petroleum reserves and hastening the day when other sources of motor fuels and lubricants possibly would be needed, the bureau completed preliminary plans for an extensive research program on the production of synthetic liquid fuels from coal, oil shale, and other materials, says Director R. R. Sayers in his report for the Bureau of Mines.

Perhaps foreshadowing a great new postwar industry, the program called for construction and operation of laboratories and demonstration plants to develop the technical "know how" of synthetic fuels, which ultimately may be needed to preserve motorized transportation and assure adequate national defense for future generations of Americans.

Three new helium plants were completed and put into operation, increasing the total to five and enabling the bureau again to meet all requirements of the armed forces and for the first time to provide considerable quantities for commercial and scientific uses. The Army and Navy "E" was awarded to the Amarillo and Exell, Tex., plants for their remarkable production records.

Operating under wartime stress, the bureau's petroleum and natural-gas research workers drew many special assignments on primary extraction of petroleum, secondary recovery, and refining problems to aid producers and refiners in meeting production schedules for fuels and lubricants for war machines, toluene for explosives, and materials for synthetic rubber. New sources of base stock and high-octane components for blending into aviation gasoline were determined.

In the field of mineral fuels attention of the Geological Survey was directed primarily to search for new supplies of petroleum, Director W. E. Wrather says in his report for the survey. Regional studies were initiated in 23 states and Alaska to obtain data on the distribution of possible oil-bearing formations and to locate broad areas where conditions in these rocks might be favorable for accumulation of petroleum.

DEATHS

Frank C. Moon, 48, oil-field contractor, died February 15 in Franklin, Pa.

Leland P. Harrington, 67, retired assistant secretary and treasurer of Pure Oil Co.'s southwestern division, died February 19 in Tulsa. He had been with Pure 37 years, starting with the original company at Marcus Hook, Pa.

T. Shelby Black, 67, treasurer of Jenkins Petroleum Process Co. and of Donnelly Process Corp., both Chicago,, died February 15 in Los Angeles, where he resided.

Thomas C. Hackett, 75, retired oil-well driller whose employment had taken him to Mexico, Asia, Europe and South America, died February 14 in Rocky Grove, Pa.

W. Earl Smith, 61, member of Haynes B. Ownby Drilling Co. and a charter member of National Oil Scouts and Landmen's Association, died February 12 in Dallas. Smith was a director of Mid-Continent Oil and Gas Association. He and his brother formerly operated E. L. Smith Oil Co., of Mexia.

Louis J. Walsh, 51, vice president and treasurer of Eastern States Petroleum Co., Inc., died February 12 in Houston. Walsh was one of the organizers of the company in New York in 1932 and he went to Houston when it opened offices in that city in 1935. He graduated in mechanical engineering from Tufts College, obtained a law degree also, and was admitted to the Massachusetts bar, but instead of practicing law began a career in oil. For years he was connected with Colonial Beacon Oil Co., becoming its vice president.

Brig. Gen. W. H. Eaton, 38, sales manager for Shell Oil Co., Inc., in New York, when he entered the Army Air Forces as a captain in 1942, was killed in an airplane crash in France February 6. He had advanced to a colonelcy, and the U. S. Senate on February 12 posthumously confirmed his promotion to the rank of brigadier general.

John M. Scott, 77, for many years an oil operator in Wise, Archer and Wichita counties, Texas, died February 12 in Decatur, Tex.

E. L. Smallwood, 58, formerly active in Texas oil operations, but in recent years a resident of New York, met death February 11 in an automobile accident near Butte, Mont., where he had gone on business.

Jesse J. Horne, 60, long an oil producer and driller, died February 12 in Rouseville, Pa.

O. LeRoy Kelly, 59, for a quarter-century a gager for Socony-Vacuum Oil Co. and Forest Oil Co., died February 12 in Duke Center, Pa.

James Brann, 82, pioneer independent oil operator, died February 15 in Bartlesville, Okla. He completed his first well in Oklahoma at Cleveland on Thanksgiving Day, 1905, and he was engaged in drilling and producing operations in the Osage country 40 years. Brann was president of Rine Drilling Co. He drilled his first well in Warren County, Pennsylvania, in 1883. He served as sheriff of that county and a term in the state legislature. A son, Emmett R. Brann, is an independent operator of Houston.

Omer L. McQueen, 87, last of the crew that drilled the first commercial well on Richburg Hill, New York, in 1881, died February 10 in Belmont, N. Y. For many years he operated a farm.

Charles E. Hoag, 60, one of Gulf Oil Corp.'s earliest employes, dropped dead February 16 at the company's Port Arthur, Tex., refinery, where he was a stillman.

Raymond P. Moore, 62, oil producer of Allegany County, New York, died February 15 in Bolivar, that state. He was a partner in Moore Oil Producing Co. and a director of Allegany Refiners, Inc.

William P. Hyde, 97, oil producer, of Bradford, Pa., died February 16. After attending Allegheny College he entered the oil industry and at his death he had leases in the Bradford and Tiona areas.

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Houdry Cycle-Timing System

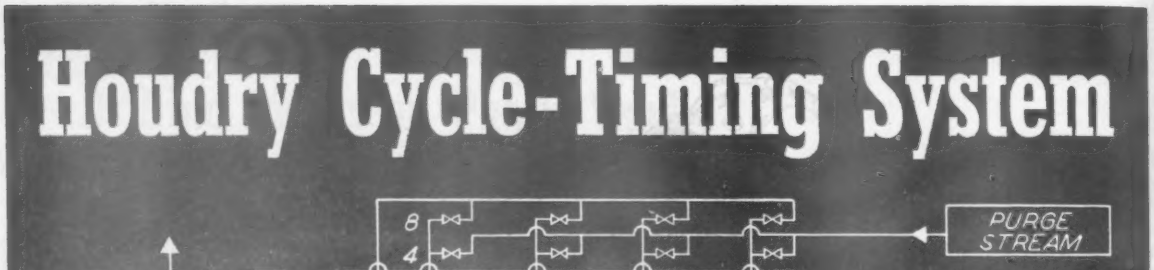

Fig. 1—Diagrammatic arrangement of cases and major operating valves

Precision timing of operating sequences in the Houdry catalytic cracking process are discussed here. The timing apparatus, how it functions in maintaining uniform production rates, and its relation to other control instruments is described

by R. B. Tuttle

AUTOMATIC control apparatus as employed in modern process systems is usually concerned with such variable factors as temperature, pressure, flow, and in some cases with the quality and quantity of the substances produced. This includes control device for metering and automatic proportional regulation of two or more process factors on either a volume or weight basis. Irrespective of the type and number of controls employed in a system, there is no doubt that, without the benefit of adequate automatic control, the various process industries could not be operated as they are today.

Along with the usual devices for automatically controlling the different process variables, there is another which functions to control time periods and operating sequences. This is the variable cycle timer. It can be employed in any process that depends upon the beginning, ending, and sequence of a series of operations that must be carried out in accordance with a fixed cycle or schedule. The application of this timing device, along with certain other control apparatus, to a modern refining process is well illustrated in a Houdry catalytic-cracking installation.

As a result of the application of this cleverly designed timing instrument, the Houdry process was converted from an intermittent or semi-continuous laboratory development into the first continuous catalytic-cracking process put into commercial use. Due to the controlled cycle timing of the series of intermittent operations, basic flow in the commercial process remains unchanged from that originally developed in the laboratory.

Houdry Flow Arrangement

Except for the equipment incorporated in the variable cycle timer, the Houdry plant is composed of conventional items arranged in the usual order for operation as met with in comparable processes. A constant rate of production is obtained by staggering the on-stream periods of several intermittently operated reactors usually referred to as "Houdry cases." These cases are interposed between a continuous throughput vapor heater and a system of fractionators. In commercial operation the number of cases in operating service largely depends upon throughput rates, charge stocks, and other particular operating conditions.

Socony-Vacuum Oil Co., Inc., at its Lubrite refinery, East St. Louis, Ill., operates one of the first Houdry units put into service. This unit is a six-case installation; however, at various times it has been operated on a five, a four, and a three-case cycle. The usual practice is to operate all six cases except at times when it is necessary to remove cases from service for maintenance or catalyst changing.

The simplified flow diagram, Fig. 1, shows the functions of all of the valves and the piping arrangements to the cases for a four-case operating setup. This arrangement is typical for any operation, the only variation being in the number of cases in service at a time. Each case is connected into the system through two valve manifolds, one at the top and one at the bottom of the case. Each manifold mounts four motor-operated valves for connecting the case headers into the various service lines. In addition to these individual case valves, there are six more motor-operated valves, the operation of which is common to all the cases. They are the No. 11 unit bypass, the No. 12 unit inlet, the No. 13 unit outlet, and the Nos. 9, 19, and 20 which work in conjunction with all No. 3 valves to oil repressure or evacuate the cases.

The opening and closing of all valves except Nos. 11, 12, and 13, is controlled by the variable cycle timer. As these three valves are used only in bringing the unit on or off stream, they are operated by push-button from the control panel. Operating time for the different motor-operated valves is as follows: for 4-in. valves, 5 seconds; for 8-in. valves, 8 seconds; for 12-in. valves, 12 seconds, and for the 18-in. valves, 55 seconds.

The motor-operated valves are Powell 300-lb. gate valves equipped with Cutler-Hammer power units. They are operated by 440-volt, 3-phase, 60-cycle alternating-current motors controlled through reversing-type magnetic contactors. One hundred and ten-volt, single-phase, 60-cycle control current for operating the magnetic contactors and furnishing power to the cycle timer is supplied by the ungrounded secondary of a step-down transformer connected to the main power feeder for the unit. A standby source of power is maintained for operating the valves in the event of a failure of the normal source of power.

All the valves are electrically interlocked, the purpose being to prevent the possibility of having a dangerous mixture of air and oil in any part of the process. This system of interlocking the valve operations is worked out with multicontact limit switches that are built into the valve operators. The contacts of these limit switches change position mechanically with the opening and closing of the valves. The limit switch contacts are also used to operate the valve-position indicating lights, to operate auxiliary equipment such as solenoid valves and time switches associated with the process, and to furnish test contacts so that the cycle timer can check all valve operations after they have been initiated.

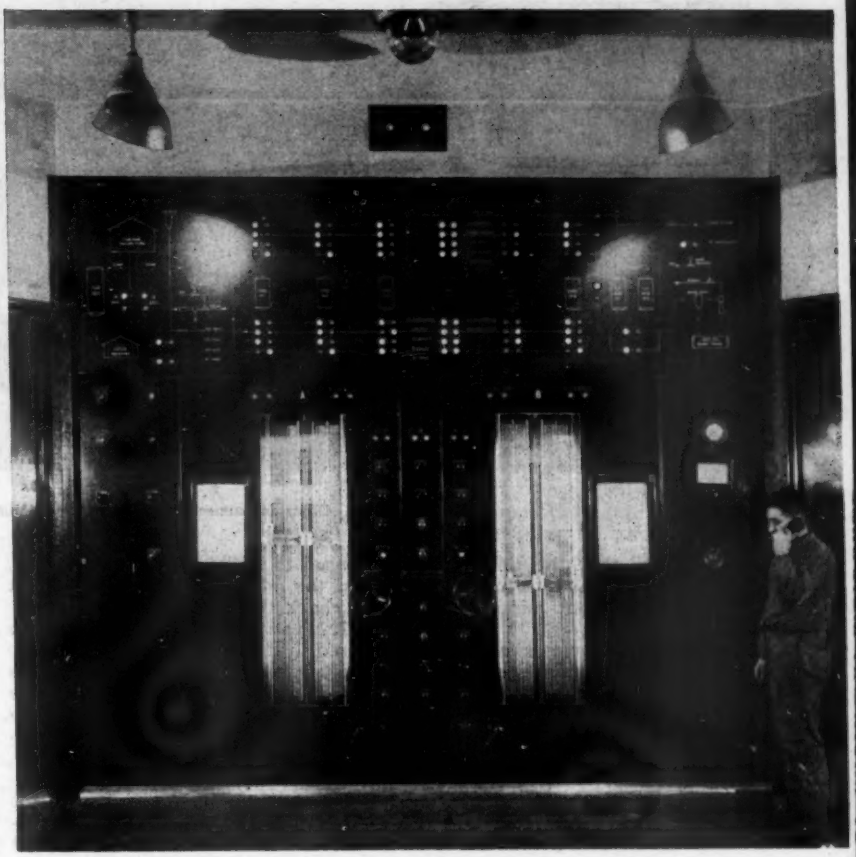

Fig. 2—Cycle-timer section of instrument panel in Houdry control room

There are two principal types of commercial cycle timers, the rotary type and linear type. In the rotary type the segments are arranged in a circle with the timer arm pivoted in the center. As the arm rotates about its axis it passes over the various segments initiating the desired operation. In the linear-motion type the segments are arranged in vertical columns and the timer arm passes up and down over the segments. The Lubrite installation consists of two identical linear motion timers, one being maintained for emergency service. They are inter-

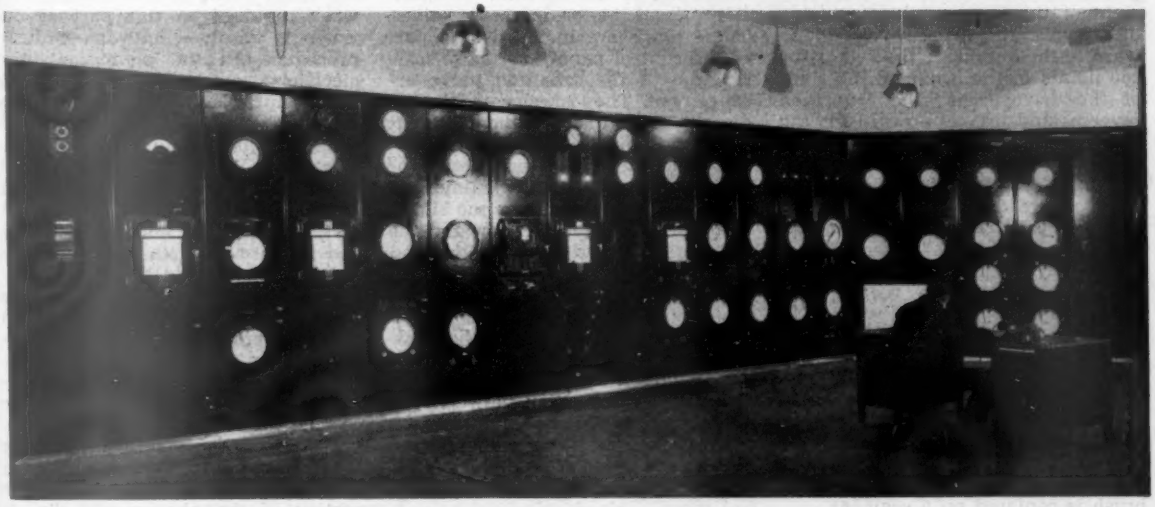

Fig. 3—Control apparatus located to the right of cycle timer

Fig. 4—Other instruments to left of cycle timer

connected so that the unit can be switched from one timer to the other at will and without missing a single operation.

Power to each timer unit is delivered by a constant-speed motor through a mechanically adjustable speed changer. Total cycle time can be varied from 30 to 60 minutes as desired. The timer arm which carries the contact brushes is held by two guide rods and is driven by means of a revolving screw in the manner of the screw feed drive on an engine lathe.

Each timer has a total of 720 individual segments. To the right and to the left of the driving screw are two adjacent groups of 180 segments and two common contact rails. The segments, uniformly spaced parallel to the common contact rails, provide a group of 360 available circuits per one-half cycle. A complete cycle consists of a trip up and a trip down for the timer arm. For example, if the first segment at the top right of the timer is the beginning of a cycle, the arm travels downward to the bottom or the last of the 180 points in the group to the right of the drive screw, the arm then reverses and travels upward for the 180 segments to the left of the drive screw. As this was the original starting point, the direction of travel is again reversed for the beginning of another cycle. Reversing of the contact arm movements is carried out electrically, the last segment in the group being used to reverse the driving motor. For safety reasons limit switches are placed at the top and bottom of the timer to prevent overtravel in the event of failure of the motor reversing contactor. Electrical impulses are synchronized with the position of the brushes on the segments, so that impulses are sent out only at the time when a brush is centered on a segment.

In operation one set of segments is used to initiate a valve operation, and the adjacent set is used to test or check the operation.

The valve-operating segments are wired to the corresponding magnetic contactors so that the timer impulse will open or close the proper valve as desired. The test segments are wired to the corresponding valve-limit switches so that the timer impulse will check the position of the valve to be tested. Each test or check impulse is set up three segments behind the valve operation it is to check. This permits the valve to finish its operation before it is to be tested.

Cycle-Timer Safety Feature

In the event the timer fails to clear a test the timer automatically stops and a set of signals informs the operator which operation has failed to clear.

A set of signal lights is connected into the various operating circuits indicating to the operator the position of all motor-operated valves. These lights are included as a part of the control panel in a large-scale diagram of the case and valve arrangement. They are located in the diagram according to the different positions they occupy in the process, giving to the operator a picture of operating conditions at all times. In indicating valve positions the signal lights are arranged to show red for an open valve and green for a closed valve.

In Fig. 2 are shown the two timers, the simplified flow diagram of the unit with signal lights, and the bank of control stations for operating the key valves in the process.

Occupying a position between the sections of panels shown in Figs. 3 and 4, the cycle timer panel forms the lower portion of a U-shaped instrument panel layout in the control room.

Those instruments shown in Fig. 3 are located on a panel to the left of the cycle timer section, and those shown in Fig. 4 are located on a panel to the right of the timer. All of these instruments are strictly for operation of the Houdry process and include various types from ordinary indicating pressure gages, temperature recorder controllers, and flow controllers, to watt-hour recorders, pyrometers, potentiometers, and special flow controllers operating in conjunction with the cycle timer. The instrument layout is well balanced for operating convenience with the grouping of type and function carried out to the last detail.

Fig. 5 is a behind-the-panel view of the cycle timers. First time observation of the group of leads and other electrical apparatus leaves the idea that such an arrangement would present an extremely complex problem to the operators. However, due to a systematic scheme carried out in the identification of the many leads and terminals, any work required on this part of the timer is resolved into an orderly procedure. In the photograph the electrician for the unit is holding the group of leads for one case; this is nearly one-sixth of the leads for a single timer. The loose-end terminals on all leads are coded so that each is readily identified with its specific functions. A terminal rack carrying the fixed ends of the leads and the circuit wires to the various reversing magnetic contactors appears on the left side of the timer and is shown in the near position in the photograph, Fig. 5. When setting up control circuits for any desired operation the loose-end terminals are plugged onto the proper post on the back of the timer panel. These posts extend through the timer panel into the segments on the face of the timer. In the upper portion of the photograph, Fig. 5, are a group of relays and other elec-

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TABLE 1

Sequence				Schedule			
Period		Valve operation		Timed from Case 1 (min. & sec.)			
Begin	End	Opening	Closing	Case 1	Case 2	Case 3	Case 4
On stream		2	..	0-00	9-00	18-00	27-00
		1	..	0-06	9-06	18-06	27-06
		..	9	0-18	9-18	18-18	27-18
		..	1	9-24	18-24	27-24	0-24
	On stream	..	2	9-30	18-30	27-30	0-30
Oil evacuation		20	..	9-36	18-36	27-36	0-36
		3	..	9-48	18-48	27-48	0-48
		22	..	10-06	19-06	28-06	1-06
		19	..	10-18	19-18	28-18	1-18
		..	20	10-48	19-48	28-48	1-48
Steam purge		4	..	11-54	20-54	29-54	2-54
	Steam purge	..	4	12-54	21-54	30-54	3-54
	Oil evacuation	..	3	13-00	22-00	31-00	4-00
Air in		8	..	13-18	22-18	31-18	4-18
		..	22	13-24	22-24	31-24	4-24
Regeneration		6	..	14-24	23-24	32-24	5-24
		5	..	14-30	23-30	32-30	5-30
	Air in	..	8	14-36	23-36	32-36	5-36
		..	19	16-48	25-48	34-48	7-48
		..	5	32-48	5-48	14-48	23-48
	Regeneration	..	6	32-54	5-54	14-54	23-54
Air evacuation		7 & 21	..	33-12	6-12	15-12	24-12
	Air evacuation	..	7 & 21	35-00	8-00	17-00	26-00
Oil in		9	..	35-06	8-06	17-06	26-06
		3	..	35-18	8-18	17-18	26-18
	Oil in	..	3	35-42	8-42	17-42	26-42
On stream	(Cycle end repeat)	2	..	36-00	9-00	18-00	27-00

trical apparatus for the signal lights, and partly visible below the leads are the speed changers that operate the driving screw for the contact arm.

Time periods, sequence of operations, and cycle time for specific operations are set up in chart form for the electrical group by the operating and electrical engineering divisions of the plant. The chart, relatively simple in form, includes terminal and timer segment identification codes; hence, the electricians can expeditiously set up any desired operation.

Typical Operating Sequence

Table 1 shows a typical Houdry operating sequence with four cases in service and a 36-minute time cycle. This particular cycle would be suitable for cracking overhead gas oil from reduced crude to motor gasoline. The column marked "sequence" shows the operation of one case during one complete cycle. The "period" column is a listing of the several case operations according to the order in which they occur.

The case begins the cycle with the "on-stream" or cracking period. After this is completed, the case is evacuated of all oil vapors and a small amount of purge steam is admitted. Next, the case is slowly repressured to 45 lb. with air and then put on regeneration or burning time. After the prescribed time for regeneration, the case is evacuated of all air and gases, repressured with oil vapors, and then placed on stream again. This cycle is constantly being repeated.

The numbers listed under "valve operations, opening and closing" refer to the valves as numbered in Fig. 1. Valves 21 and 22 are solenoid valves controlling instrument air to the steam regulators on the evacuating jets.

The schedule column gives the duration of time of the above-mentioned periods and shows how individual case operations are staggered in order to give smooth continuous operation. The time of the initiating impulse for each operation is shown by the number of minutes and seconds that it occurs after the opening of No. 2 valve on No. 1 case.

An illustration of the sequence of events as a case comes on and off stream will help to clarify this. Referring to Table 1, case No. 1 comes on stream with the opening of No. 2 valve, time 0-00, and No. 1 valve, time 0-06. This same case goes off stream with the closing of No. 1 valve, time 9-24, and No. 2 valve time 9-30. However, before No. 1 case can be taken off stream one must be absolutely sure that No. 2 case has been put on stream; otherwise, the continuous flow through the unit will be interrupted. Therefore, the No. 2 case on stream period must begin before the time 9-24, but as close to it as possible. This is accomplished by setting the opening of No. 2 valve No. 2 case at time 9-00, and the opening of No. 1 valve No. 2 case at time 9-06. The difference between the opening of No. 1 valve No. 2 case, time 9-06, and the closing of No. 1 valve No. 1 case, time 9-24, is 18 seconds or 3 segments. This is the minimum time that will permit valve operation and position testing.

If the regeneration period is checked in this fashion it will be seen that two cases are always on regeneration at a time. Therefore, if the complete sequence is checked at any instant one of the cases will be on stream, two cases will be on regeneration, and the fourth case will be on oil evacuation, air evacuation, oil repressure, or air repressure, depending upon the particular instant that the sequence is checked.

With other operations to which the Houdry process is adaptable, such as treating, the above-listed condition would most likely have to be changed in order to get most efficient operation.

By comparing the number of available timer segments with the number of case and valve arrangements possible, the flexibility of this cycle timing arrangement becomes more apparent. The Lubrite cycle timers have been wired for more than 25 different operating sequences.

Fig. 5—Circuit leads in rear of cycle timer

Geological Eccentricities in Mississippi Pose Completion and Production Problems

by Neil Williams

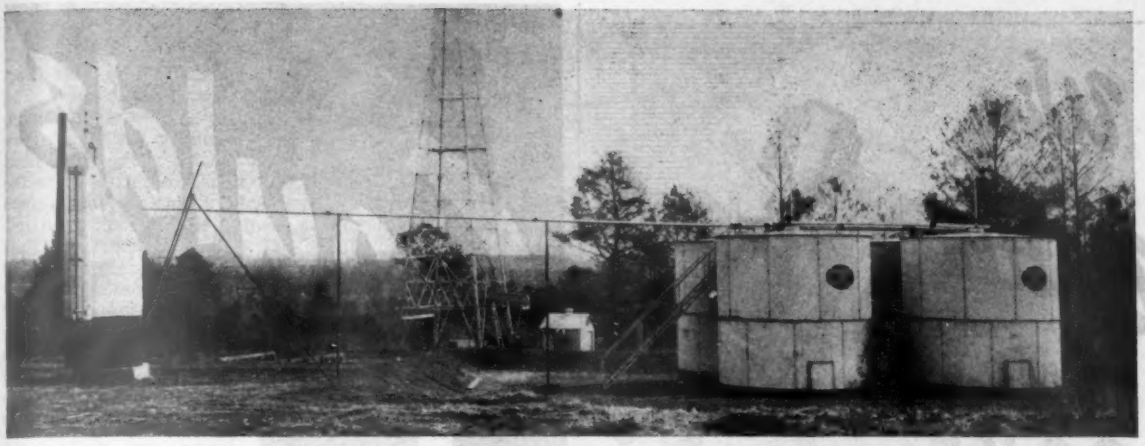
At least seven different horizons yield oil and gas in Mississippi, ranging from Moody's Branch formation of Jackson-Cockfield age, to the Hartselle sandstone of Mississippian age. Two fields, Heidelberg and Eucutta, are characterized by low pressures and lack of gas. Gravity and type of oil differ in corresponding sands at equivalent depths from field to field, for no good reason.

EXPLORATION and development in South Mississippi have revealed a number of eccentricities in structural and formational characteristics and general operating conditions. These have created various problems which have necessitated adoption of special methods and precautions to expedite drilling, completion, and production of wells. Particular complications have arisen in some fields and prospective areas in attempts to prove up production after it is found. This article will discuss some of the conditions and problems and measures being taken to overcome them.

To date, 13 oil and/or distillate and 3 dry-gas fields have been established in Mississippi. Two of the gas fields, Amory and Jackson, are of long standing, but all the other fields have been found since 1939, and the majority within the past 2 years. Twenty-six salt domes, all of which are prospective oil fields, have been proved by drilling. Only one of these so far is included in the list of new fields, although all the new fields so far opened, with one or two possible exceptions, are assumed to be associated directly with salt domes, probably deeply seated, but as yet unproved.

Oil and gas production in the state now is being obtained from at least seven different horizons, including, from youngest to oldest: The Moody's Branch formation of Jackson-Cockfield age; Wilcox sand of Tertiary age; Selma chalk (in sandy and sandy lime phases of this formation); Eutaw; Tuscaloosa, and the Hartselle sandstone of Mississippian age (small gas production in the Amory field in the northeastern part of the state). Principal development at this time is in the Eutaw and Tuscaloosa sands, which have been found productive in many of the fields of the south half of the state. The only production in the Moody's Branch formation is a shallow gas well recently completed on the Bruinsburg salt dome, Claiborne County. This is the first of the known shallow, piercement-type domes on which any production has been proved so far. The only Wilcox production is at Cranfield, Adams County, this being confined to two wells on top the structure, where the productive area is indicated as being relatively small. Principal production at Cranfield is from the Massive sand (Basal Tuscaloosa). Main Selma oil production is at Tinsley, Yazoo County, Mississippi's

Right: Central separator and tank-battery installation in Cranfield field. Below: Typical pumping well in Eucutta field



Typical lease battery at Heidelberg field, showing combination heater-treater and separator installation (left)

first field. Small oil production from this formation is found at Flora, Madison County, and Carey, Sharkey County, and also at Gilbertown, Choctaw County, Alabama, just across Mississippi line. It is gas-producing horizon of the Jackson field.

Completion Practices

Complications in well completions lie in the multiplicity of sands that exist through the Eutaw and Tuscaloosa sections. The sands are shaly and often thin and in close association with water, and difficulty usually is experienced in determining effective zones of saturation. Southwestward across the state, the Massive sand in the base of the Tuscaloosa represents the principal productive horizon. This section builds up forming a substantial section 100 to 200 ft. thick, although sand thicknesses are more or less inconsistent with lots of shaling up at places. At Cranfield, Adams County, the section, found at 10,300 to 10,400 ft., may run from 125 to 150 ft. thick although the actual sand may vary from less than 10 to 20 ft. up to 70 ft., averaging about 50 ft. Also it lacks uniformity from well to well, following no set rule as to this. In this part of the state, the Eutaw overlying the Tuscaloosa is not well defined and as yet is not indicative of production.

Progressively eastward and northward, the Tuscaloosa starts to break up into streaks of sands, and does not seem to carry the productivity. For instance at Heidelberg and Eucutta, showings have been encountered in sundry Tuscaloosa sands, but so far it has been impossible to complete any wells, except in the original discovery well at Eucutta, which produced only for a short time. Instead, production comes in in a section taking in the lower Eutaw and Upper Tuscaloosa. This applies to Heidelberg and some of the fields westward. At Eucutta only the upper Eutaw sands are productive.

One of the chief difficulties has been that interpretations of electric logs in many instances have been puzzling, and until their significance in relation to Mississippi formations is learned they cannot be relied upon entirely. Operators, particularly on wildcat and semiwildcat tests, usually must resort to every means at their disposal to check with electric logs, and then frequently have trouble determining zones of production and eliminating water. General use is made of mud-analysis logging and sidewall coring, and an extensive amount of conventional coring is required, supplemented with frequent drill-stem tests of various zones. Indicative of the amount of coring done is the record of a deep test recently drilled in Jasper County. In this well 100 separate cores were taken through the Eutaw and Tuscaloosa, embracing a section from 6,242 to 8,153 ft., total of 1,911 ft. Of this, 961 ft. was cored. The core record follows:

No. Cores	Depth (ft.)	Footage (ft.)
53	6,242-6,762	520
9	7,372-7,462	90
26	7,600-7,835	235
7	7,835-7,905	70
5	8,107-8,153	46
100		961

Sidewall Cores Taken

In addition, 25 sidewall cores were taken at various levels from 6,620 to 7,957 ft. Drill-stem tests were made at 6,592-6,650 ft. in the Christmas sand (Eutaw) and at 7,820-35 ft. in the Massive sand (basal Tuscaloosa). Top of Tuscaloosa was 6,696 ft. Electric logs were run from a depth of 6,762 ft. and again from bottom at 8,153 ft., where also a dipmeter survey and a caliper survey were made. Seven-inch casing was cemented at

Representative Mississippi drilling operation showing type of country

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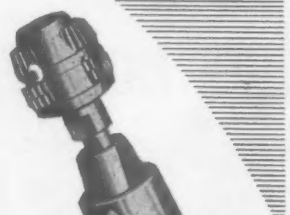

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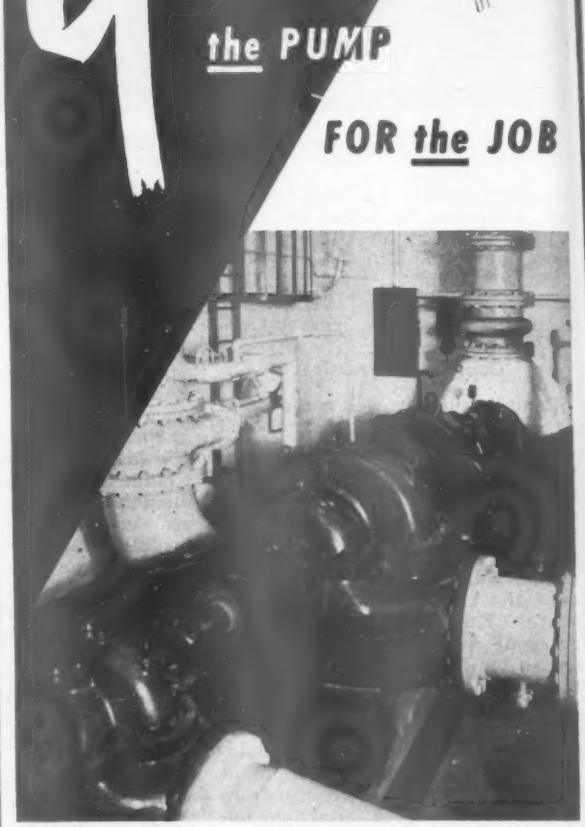

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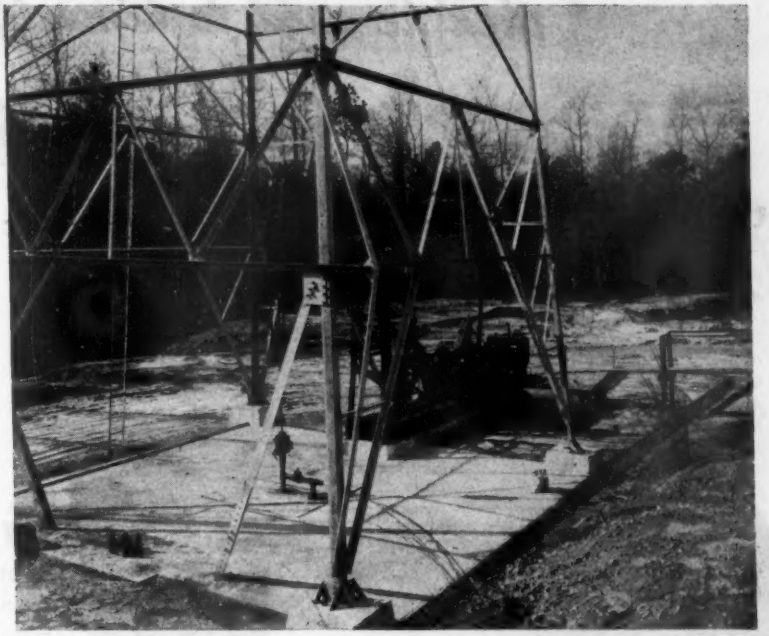
7,900 ft. to test various sands above that level. First perforations at 7,828-34 ft. tested salt water.

The tedious procedure often required to determine and isolate the most effective productive zones is indicated in the difficulties experienced by Pure Oil Co. in the recent completion of its 2 McDowell at Carthage point, southwest of Natchez, Adams County. This well, a condensate and gas producer, is the second completion in this field, the discovery well, completed in 1943, having been temporarily abandoned after producing only a short time. Production in this field and other deep fields in this part of the state is from the Massive sand, basal Tuscaloosa, the Upper Tuscaloosa and Eutaw being shaled out or else carry water. The various long steps after starting with coring for the Massive sand in the Tuscaloosa follow:

Cored 9,651-52 ft.
Cored 9,720-33 ft.
Cored 10,240-290 ft.; top of Massive sand 10,264 ft.
Cemented 7-in. casing 10,290 ft. (bottom).
Cored 10,290-93 ft.
Drill-stem tested open hole with packer set at 10,270 ft.; tested gas, condensate and salt water.
Cored 10,293-305 ft.; 10,305-15 ft.; 10,315-27 ft.; 10,327-35 ft.
Set and cemented 109 ft. of 5-in. liner 10,335 ft.
Perforated liner 10,320-324 ft.; drill-stem tested salt water; squeezed perforations.
Reperforated 10,320-324 ft.; drill-stem tested salt water; squeezed.
Reperforated 10,315-20 ft.; drill-stem tested salt water; squeezed.
Reperforated 10,316-19 ft.; drill-stem tested salt water; squeezed.
Drilled out of liner to 12,139 ft.; ran electric log.
Plugged back to 10,346 ft.; ran gamma ray to recheck saturation points behind liner and casing.
Perforated 10,315-17 ft.; drill-stem tested salt water; squeezed.
Reperforated 10,305-10 ft.; drill-stem tested; flowed condensate and salt water; squeezed.
Drilled out to 10,311 ft.
Perforated 10,304-09 ft.; drill-stem tested; flowed salt water and gas with show of black oil; squeezed.
Reperforated 10,273-86 ft.; drill-stem tested; flowed 5 bbl. 57.1° gravity condensate per hour, top pressure 3,400 lb.
Ran production packer on 2½-in. tubing at 10,228 ft.; swabbed in clean and flowed 91 bbl. 54° gravity amber distillate, gas-oil ratio 22,385/1.

At both Heidelberg and Eucutta, on the opposite side of the state, completion practices generally until recently have called for taking in the entire productive section by perforating the full column of sands. At Heidelberg, the section lies in the lower part of the Eutaw and top of the Tuscaloosa at depths ranging from around 4,400 ft. to below 5,100 ft. It is from 500 to 600 ft. thick with a total of from 150 to 200 ft. of net sand, representing 15 different zones. At Eucutta the section is in the upper part of the Eutaw at depths ranging from around 4,800 ft. to below 5,100 ft. It runs from about 150 to 200 ft. thick, containing a multiplicity of thin sands and shaly sands in addition to three main sand zones. Sands in both instances, but particularly at Eucutta, are very shaly, with low permeability and in close association with water.



Individual pumping units of this general type are employed at Heidelberg and Eucutta fields

Segregation of the various sands usually has not been undertaken due to the similarity of production from the various sands in the respective sections, and particularly because the sands are so intermingled in the shales that it has been difficult to determine the most effective zones of oil saturation. At Eucutta, some operators hold the belief that all the sands constitute a common reservoir, interspersed with shale breaks, and give the water-oil contact at minus 4,874 ft., with surface elevations running from 300 to 350 ft. In many wells lately, efforts have been made to confine completions to the most important sand zones, with particular emphasis upon the City Bank, or second of three main sands, which is the most consistent over the field.

Determining Sources of Water

In wells in which the entire section has been taken in, considerable difficulty has been experienced in determining sources of water production appearing in wells. It has been necessary in many cases to squeeze cement all perforations, and then reperforate and drill-stem test at successive levels from bottom up until the water shutoff is effected and the proper oil zone determined. Due to the thin sands and shaly conditions this often has been a tedious undertaking.

Production conditions vary greatly as do types of production. Gravity and types of oil differ in corresponding sands at equivalent depths from field to field, for no apparent reason. The Massive sand at Cranfield yields 39° to 40° gravity paraffinic oil of good quality (depth 10,300 ft.). Brookhaven, Lincoln County, only 70 miles distant and producing from the same corresponding sand at approximately the same depth, is making 24° oil. Mallalieu, 10 miles from Brookhaven, produces light gravity oil from the same sand. At Baxterville, Lamar County, a 16° asphaltic base, road-oil type of crude is produced. At Carthage Point, Adams County, southwest of Cranfield, production from the same formation is a 54° gravity condensate, although this may represent a gas-cap phase of the reservoir since condensate also is produced from upstructure wells at Cranfield, which has a gas cap. Gwinville, Jefferson Davis County, is producing from the Eutaw and Upper Tuscaloosa. Oil production at Gwinville, in the upper Tuscaloosa, is 38° gravity. Two Eutaw wells produce condensate. At Eucutta, in upper Eutaw, oil is a heavy asphaltic type running from 19° to 24° gravity (average 20° to 21° gravity). At Heidelberg, lower Eutaw and upper Tuscaloosa, oil is slightly lighter, being 22° to 24° gravity but is same type. The discovery well at Eucutta, completed in the lower Tuscaloosa, produced a 16° gravity oil. Selma production at Flora and Carey is 25.5° gravity, although at Tinsley, not far distant, it runs about 38°

(Continued on page 148)

then he said to himself

"Now they'll dance to my tune"

GENERAL MONTGOMERY'S great wins in competition with the most foxy of enemies . . . first at El Alamein . . . later on the Western Front . . . were initiated with what he shows to be the simplest of strategies. Says he:

> "We decide, before the battle begins, how we want it to develop. We then force the battle to develop our way. I always aim at making the enemy dance to my tune."

See how this Montgomery strategy can dictate the battle in the field of Arc Welding:

Salt-Water Flows and Circulation Losses Persist in Branch Field Completions

by E. H. Short, Jr.

UNION Sulphur Co., Inc.'s, A-1 D. Andrus Unit was recently completed, after safely negotiating serious salt water flows and loss of circulation, with a well head flowing pressure of 6,300 p.s.i. This well is the third high-pressure test completed by this company in the Branch field, Acadia Parish, Louisiana, approximately 9 miles northeast of Rayne.

The history of the Branch field is one of extremely high pressures and difficult drilling conditions. Union Sulphur's 1 Gueno, drilled over 2 years ago, blew out at 10,400 ft. and ignited. The fire was extinguished under the supervision of M. M. Kinley, and 27 days from the time the blowout occurred, the well was successfully capped. The 2 Gueno, a normal surface location to No. 1, was directionally drilled to within 25 ft. above the casing seat of the blowout well. Fourteen-pound mud was pumped down 2 Gueno and within 2 hours after circulation was lost, No. 1 was completely killed.

The 3 Gueno was completed in September 1944. The drilling of this well proceeded down to 10,765 ft. without event, and at this point a salt-water flow was encountered. The mud was weighted up to approximately 12.6 lb. per gal., and then increased to 13.6 lb. which was sufficient to control the salt water flow.

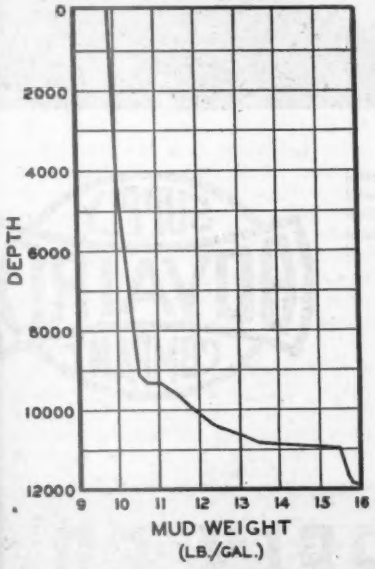


Fig. 1—Mud weight during the drilling of Union Sulphur's A-1 D. Andrus Unit

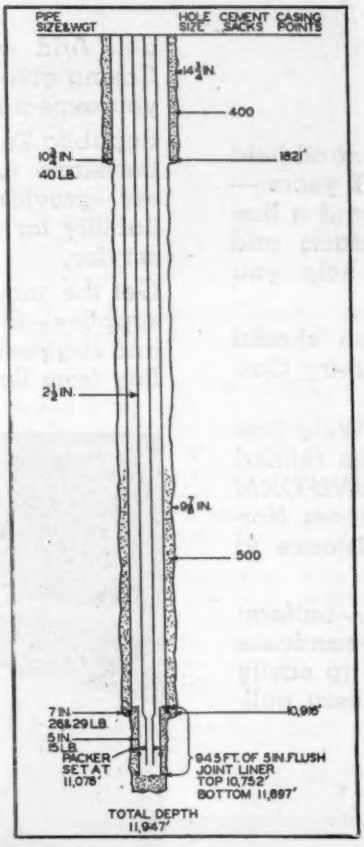


Fig. 2—Hole and casing diagram, Union Sulphur's A-1 D. Andrus Unit

While drilling in sand at 11,050 ft. with 13.6-lb. mud, the well tried to blow out, and showed a maximum pressure of 3,600 p.s.i. when closed in for a brief period. The mud weight was then built up to 17.8 lb. per gal., resulting in a loss of circulation. It was regained by reducing the mud weight to 15.7 lb. per gal. The well was completed at a total depth of 11,316 ft. with 16-lb. mud.

On the first attempt to complete 3 Gueno it flowed wash water and the pressure built up to 5,100 p.s.i. on the tubing in 40 minutes. It was then shut in to install a heavier christmas tree. While killing the well, a pressure of 3,200 p.s.i. was built up on the casing. A 19-minute drill-stem test (using a water cushion) of the 11,000-ft. sand showed 4,500 p.s.i. This well was completed for 208 bbl. of 45.4°-gravity oil while flowing through a 10/64-in. choke. The tubing pressure at this daily production rate was 6,400 p.s.i.

The most recent well drilled in the Branch field was completed in February 1945 by Union Sulphur. The same problems or a combination of the various drilling difficulties experienced in previous wells were encountered during the drilling of this well. However, the experience gained in coping with early drilling problems peculiar to this field lent itself to the development of a special drilling technique. And this is responsible for the highly

Fig. 3—Closeup of elevated mud box, mixing pump, and desanding unit

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Accurate temperature control and exact regulation of speed through this 110-foot normalizing furnace insure uniform quality in every length of Republic Casing.

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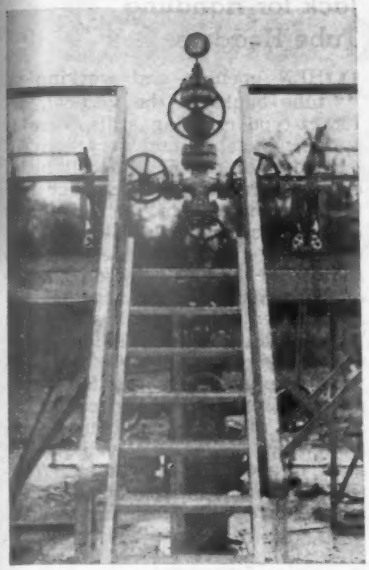


Fig. 4—Ten-thousand-pound christmas tree at Union Sulphur's 3 Gueno

Fig. 5—Ten-thousand-pound christmas tree at Union Sulphur's A-1 D. Andrus Unit

satisfactory job performed in drilling and completing A-1 D. Andrus Unit.

Mud weighing approximately 10 lb. per gal. was carried to a depth of 4,300 ft., and, as shown in Fig. 1, the weight was only 10.5 lb. at 9,100 ft. However, from this point on to the total depth the weight was gradually built up to a maximum of 16 lb. per gal.

Drilling was begun on this well on October 10, 1944. It was drilled with a company steam rig powered by a 14-in. by 14-in. steam engine. Steam was furnished by four 150-hp. boilers. Mud-pumping equipment consisted of a 16¾-in. by 7¾-in. by 20-in. pump and an 18-in. by 18-in. by 20-in. pump. Mud was mixed by a third 18-in. pump. As shown in Fig. 3, the rig was equipped with elevated mud boxes to insure maximum pump efficiency.

At 1,801 ft. 10¾-in., 40.5-lb. J-55 casing was set and cemented with 400 sacks of cement. After testing the casing with 1,800 p.s.i. water pressure, drilling was resumed and the hole carried to 9,665 ft. without difficulty. At this point the first circulation loss occurred and it was necessary to condition the mud with fibrous material in order to regain the returns.

A formation tester was run at a depth of 9,884 ft. and a 6¼-in. packer set at 9,865 ft. with ¼-in. top and bottom choke. The hydrostatic mud pressure was 5,025 p.s.i. and the b.h.p. amounted to 4,000 p.s.i.

From 10,250 ft. down to the total depth of 11,947 ft. returns were frequently lost. While no particular difficulty was experienced in regaining circulation, a vast amount of time and materials was expended on this kind of work during the drilling of the well.

A 7-in. o.d. string consisting of 26 and 29-lb. N-80 casing was set at 10,916 ft. and cemented with 500 sacks. At this point the 4-in. drill pipe was laid down and 3-in. picked up to drill the remainder of hole below the 7-in.

At 11,840 ft. returns from bottom were cut and the mud weight dropped from 15.7 to 15.2 lb. per gal. for 25 minutes. Gas cutting showed again at 11,900 ft. and the mud weight dropped from 16.1 to 12.5 lb. per gal.

After reaching the total depth of 11,947 ft., 945 ft. of 5-in., 15-lb. flush-joint liner was run and cemented with the guide shoe set at 11,697 ft.

Numerous openings were made with a gun-perforator at various points in the 5-in. liner, followed by drill-stem testing. After perforating the liner from 11,648 ft. to 11,652 ft., a test was made with the packer set at 11,573 ft. At this point the well flowed salt water weighing 9.1 lb. per gal. When closed in, the pressure built up to 2,900 p.s.i. which would place the estimated b.h.p. at 8,375 p.s.i.

The perforations at 11,648 ft. were squeezed with 100 sacks of cement, and sixteen ½-in. perforations made from 11,090 ft. to 11,094 ft. At this point the tester recovered 43°-gravity oil. After running 2½-in. tubing, a packer was set at 11,076. Gages for the first few hours after the well went on production showed it to be producing at the rate of 162 bbl. per day through a ⅛-in. choke, with a surface tubing pressure of 6,300 p.s.i.

During the past 2 years, completions along the Gulf Coast have shown a gradually increasing rise in well-head pressures, and operators have shown a keen interest in the drilling-completion technique employed in each area where pressures have established a new high. There are a number of wells in the coastal area having 5,000 p.s.i. or slightly over, and several having a 6,000-p.s.i. flowing pressure. A well in the Chocolate Bayou area was recently completed with a flowing pressure of 6,500 p.s.i. At the present time, however, the Branch field seems to be in a high-pressure class of its own, and it is expected that the drilling and completion methods worked out by Union Sulphur will contribute much to the successful completion of future Gulf Coast operations involving extremely high pressures.

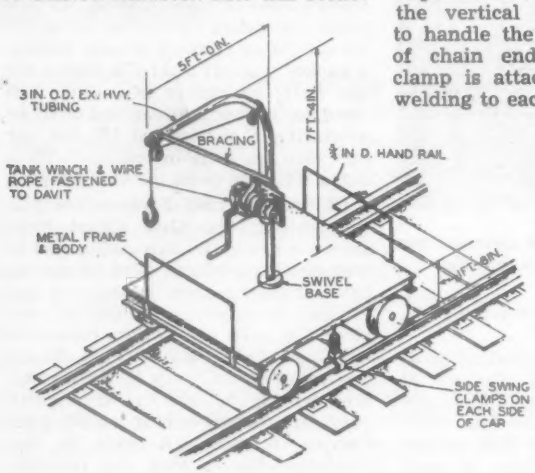
Fig. 6—Members of Union Sulphur Co., Inc.'s drilling crew taken immediately after A-1 D. Andrus Unit had been safely completed and turned into the line with a well-head pressure of 6,300 p.s.i.: R. M. Robinson, backupman; John Akers, fireman; J. H. Fretwell, derrickman; E. W. Wilkerson, catheadman; Frank Venable, driller, and Adam L. Vincent, drilling foreman

PLANT PRACTICES

Used at Sinclair Refining Co. Plant in East Chicago

Flat Car Crane

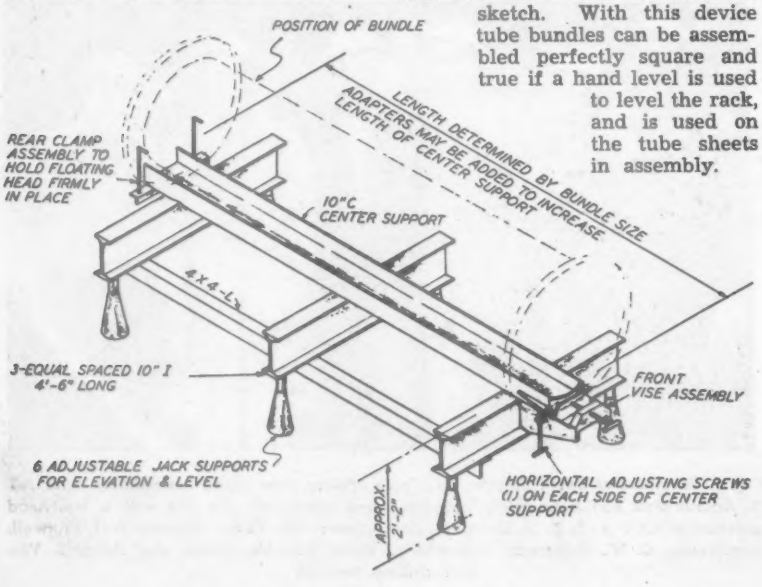
AN iron body was fitted to an ordinary hand flat car such as is used by railroad track workers. In the center of this car a socket base was fitted, made of a section of steel pipe of desired diameter. Into this socket is fitted one end of a 3-in. o.d. pipe, bent on a curve to extend about 7 ft. high, making a right-angled davit. A block is fitted to the upper horizontal end of this davit, through which a ½-in. wire line is passed ending in a hook or other fitting as required. A tank winch is bolted to the vertical section of the davit to handle the line. A short length of chain ending in a side-swing clamp is attached with bolt or by welding to each side of the car body above the rails, which permits clamping the car to the rail to handle heavy loads. This car may be used to swing a 1,300-lb. rail into any position by one man instead of requiring up to 16 men to do it manually. It will move safely more than 2-ton loads.


5FT-0IN.
3 IN. O.D. EX. HVY. TUBING
BRACING
7FT-4IN.
¾ IN D. HAND RAIL
TANK WINCH & WIRE ROPE FASTENED TO DAVIT
METAL FRAME & BODY
SWIVEL BASE
SIDE SWING CLAMPS ON EACH SIDE OF CAR

Tube Bundle Assembly Rack

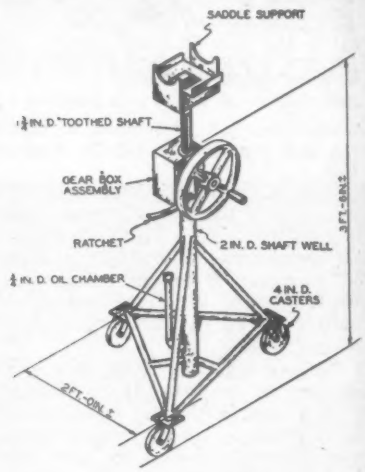
A HANDY, adjustable rack is used for holding tube bundles rigidly while rolling in tubes.

The holder base consists of a 10-in. channel with three 10-in. "I" beams equally spaced along the bottom with 4 by 4 angles welded near ends on each side. This assembly is supported on six adjustable jacks for leveling-up purposes. In use the fixed tube sheet is clamped in place with the front vise assembly. After the fixed head is in position, the tie rods and baffles are next assembled and the tubes put in place. The floating head is then put in place, lined up and clamped in place with two hook bolts as shown in sketch. With this device tube bundles can be assembled perfectly square and true if a hand level is used to level the rack, and is used on the tube sheets in assembly.


POSITION OF BUNDLE
LENGTH DETERMINED BY BUNDLE SIZE
ADAPTERS MAY BE ADDED TO INCREASE LENGTH OF CENTER SUPPORT
REAR CLAMP ASSEMBLY TO HOLD FLOATING HEAD FIRMLY IN PLACE
10"C CENTER SUPPORT
4X4-¼
3-EQUAL SPACED 10" I 4'-6" LONG
FRONT VISE ASSEMBLY
6 ADJUSTABLE JACK SUPPORTS FOR ELEVATION & LEVEL
APPROX. 2'-2"
HORIZONTAL ADJUSTING SCREWS (1) ON EACH SIDE OF CENTER SUPPORT

Jack for Handling Tube Headers

WHEN opening and working on tube banks in the vertical, de-Florez-type cracking stills, here is a light, portable, and very convenient tool for raising the coil headers or return bends into contact with the bottom ends of the coil tubes and for lowering them when disconnecting them from the tubes. As shown, the base is a pyramid made of ¾-in. pipe, welded together for any convenient size of base, casters being welded under the three corners of the base triangle. The upwardly extending elements of the pyramid support the vertical stand, a section of 2-in. pipe about 3½ ft. long which serves as a well for the shaft, of about 1¾-in. diameter. This shaft is toothed on one side. A hand wheel powering a gear and rack is welded or bolted to the stand which is cut away to allow engagement of rack with teeth on the shaft.



Atop the shaft is a U-shaped saddle made of ¼-in. sheet steel about 6 in. wide and 6 in. high, slotted to receive and hold the return bend and to lower it or raise it as required. On the side of the stand a ¾-in. nipple is welded which communicates with the well; an elbow attaches to the nipple a ¾-in. pipe 15 in. long, closed with a cap at its upper end and which extends upwardly parallel to the well. This tube is filled with oil to lubricate the shaft, and also serves somewhat as a hydraulic chamber.

In operation, the jack is rolled underneath the individual bend to be received, and the shaft raised until the saddle is in contact with the curved bend. When the bend is released from the header it rests in the saddle. The bend is replaced by bringing it under its tube, still in the saddle, the shaft is raised by the hand wheel until the bend is in position where it is secured in place in the conventional manner.

Examples of Sucker-Rod Pumping Below 8,000 Ft.

by Paul Reed

PUMPING from depths below 7,000 ft. is so unusual in the Gulf Coast and Mid-Continent areas that data regarding examples of such operations where sucker-rod methods are used are significant for applications of this type of equipment. Two wells pumping from below 8,000 ft. are particularly cited in this brief discussion and reference is made to experience with other cases of pumping from very low depths.

The most extensive deep-well pumping operations have been in California and at the Oklahoma City field. Outside of these areas only a few examples of extremely deep-well pumping have been reported in scattered pools.

On the Gulf Coast there have been only rare instances of wells pumping below 7,000 ft. at a few such fields as Hackberry, and New Iberia, Louisiana. In most cases fluid levels are high in Gulf Coast wells because of the generally prevailing high hydrostatic pressures.

An example of an unusually deep Gulf Coast well is one in the New Iberia field, which has been pumping from 8,345 ft. Sucker rods are ¾ in. which were installed because of inability to obtain ⅞-in. rods of proper specifications. In spite of the apparent overstressing of the sucker rods, it is reported that after a considerable period of service there had not been any down time since the rods were put on the beam at that depth. Fluid had been raised with a Pacific rod sectional liner 1¼-in. pump operated at a speed of 7 s.p.m. with a polished-rod stroke of 108 in.

The pump has been operated by a Parkersburg 11 AK unit with a rating of 446,000-in. peak torque and 30,000 - lb. walking - beam capacity. Daily production has been 35 bbl. per day with 0 per cent b.s.&w. of 28° A.P.I. gravity. Load and stress data have been as follows: peak polished-rod load, 21,500 lb.; peak polished-rod stress, 48,650 p.s.i. (¾-in. rods). Fluid-level data have been as follows: operation fluid level at 8,345 ft.; static fluid level at 6,990 ft.; and estimated pressure at the top of the sand, 679 p.s.i.

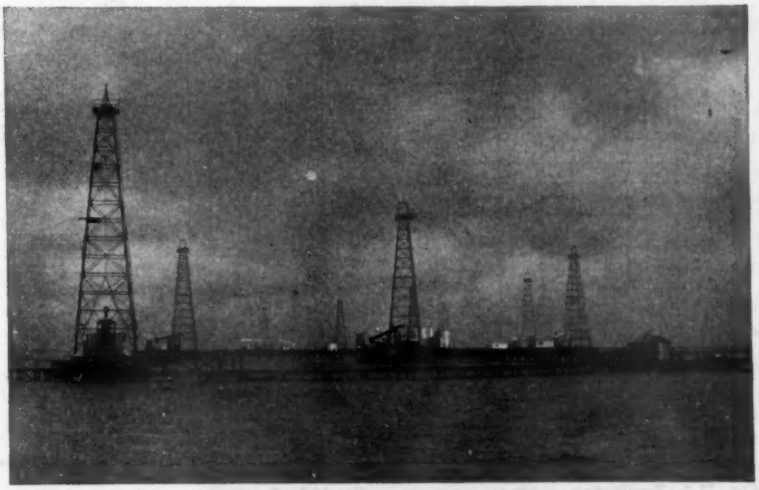
The company operating this well had previous experience with deep-well pumping but at somewhat lesser depths in this field. The offset to the well just described had been pumping from a depth of 8,805 ft. while the other had pumped from a depth of 7,249 ft. before being rigged up to pump from the depths mentioned. The former has been pumped by the same type of Parkersburg unit already referred to. This operated at 9:108 s.p.m.

In the Fruitvale field in Van Zandt County, Texas, a well has been pumping from 8,450 ft. with ⅞ by 25 ft. rods and a Fluid Packed improved insert pump operated by surface equipment consisting of a Reed air-balanced unit with a motor rated at 45 hp. Pumping has been done with a 66-in. stroke at the rate of 14 s.p.m. Daily production has been 60 bbl.; 0.1 per cent b.s.&w., 39.4° A.P.I. gravity. No difficulties have been reported with the pumping of this well.

The Buckner pool, Arkansas, has several wells which have been pumping from depths of 7,000 to 7,200 ft. for producing a 30°-A.P.I. oil together with salt water with the unusually heavy weight of 10 lb. per gal. In this pool, the surface equipment for pumping the 7,000-7,200-ft. wells has been similar to that employed for pumping wells with higher fluid levels in the 4,000-5,000-ft. range. This consists of beam, twin-crank, single and double-reduction units powered with horizontal and vertical gas engines of 40 to 60-hp. ratings. Subsurface equipment on most of the wells has included 2½-in. tubing and combination strings of ⅞-in. and ¾-in. rods. Metal-to-metal plungers of insert pumps for wells pumping from the higher levels are in most cases 1¾ in. while for the lower levels they are 1¼ to 1½ in. Wells pumping from the 7,200-ft. level have been producing between 20 and 45 bbl. daily. Most of the wells pumping from the lower depths have been operating with a 64-in. stroke at 12½ to 19 s.p.m. Dynamometer tests have indicated polished-rod loads of 16,310 and 19,310 lb. Pump failures and servicing requirements have not been abnormally high. It has been found possible to improve the small volumetric efficiency by shortening pump strokes, decreasing pump speeds and pump diameters and by part time pumping of some wells.

Although operation with an unusually long string of elastic sucker rods threatened to lead to complicated problems, it was discovered in California where early sucker-rod pumping was done below 7,000 ft. that problems encountered could be solved. After several hundred wells pumping from such fluid levels had been put on the beam in California for pumping from such fluid levels, no excessive trouble was experienced where equipment had been procured which was most suitable for such service. Similar conclusions were later reached at Oklahoma City for pumping from 6,000-6,500-ft. depths after study of sucker-rod harmonics and other considerations to determine correct plunger sizes as well as strokes and speeds of polished rods.

Experience at various points in the country with the pumping of unusually deep wells indicates that sucker-rod pumping is practicable from much deeper formations than the ones to which it is now applied.



View of Hackberry, Louisiana, field where part of the production is raised by sucker-rod equipment from depths below 7,000 ft.

Application of Equilibrium Constants

*by Park J. Jones**

Mechanics of Producing Oil, Condensate, and Natural Gas

PART 17 OF A SERIES

Consider a gas phase and a liquid phase in equilibrium with each other at a given pressure and temperature. Under these conditions:

$$K = Y/X \qquad (1)$$

where

K = equilibrium constant
X = mole fraction in the liquid phase
Y = mole fraction in the gas phase

The equilibrium constant is the ratio of the mole fraction in a gas phase to the mole fraction in a coexisting liquid phase in equilibrium with the gas phase. Each component has its own K value.

Equilibrium constants vary with pressure, temperature, and composition. Because of this variation, general application of K values to production awaits further correlation and research. There are insufficient data at this time for general application. Estimates of phase behavior of reservoir gases and liquids are limited to the available K values. A portion of the available data on K values is reproduced here for illustrative purposes.

Illustration of K Values

ILLUSTRATED in Fig. 17-1 are the K values of Katz and Hachmuth. These equilibrium constants are for a Mid-Continent 38.4° A.P.I. oil. The illustration is for 120° F.

The dashed curves in Fig. 17-2 are also the Katz and Hachmuth K values but at 250° F. The solid curves are the Standing and Katz equilibrium constants for a 49.9° A.P.I. oil and a gas-oil ratio of 3,660 cu. ft. per bbl.

The curves in Fig. 17-3 illustrates the K values of Roland, Smith and Kaveler. These equilibrium constants are for a condensate. The illustration is at 200° F.

Comparison of K Values

A comparison of K values is made conveniently by plotting two sets of data from different sources on one graph. Fig. 17-4 is an illustrative example. The pressure at which a given set of K values for a given temperature are each equal to one is called convergence pressure. By plotting two sets of K values for which there is a difference in the value of their respective convergence pressures, it becomes evident that the chief difference in K values is for methane and heptanes plus. This procedure would be used to adjust a given set of K values to the convergence pressure of a composite for which K values are required, provided the convergence pressure were known. In practice, a given set of K values is adjusted

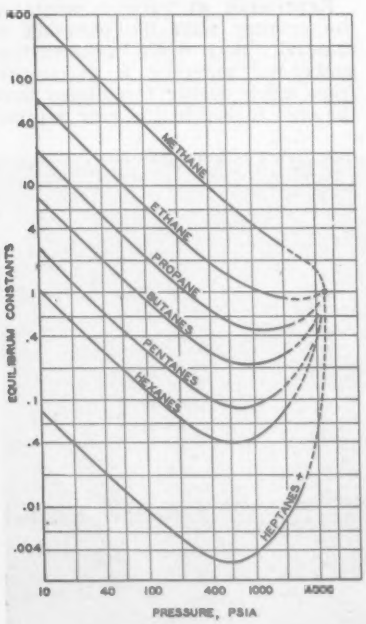


Fig. 17-1—Equilibrium constants vs. pressure at 120°F. for 38.4° A.P.I. oil and gas. After Katz and Hachmuth

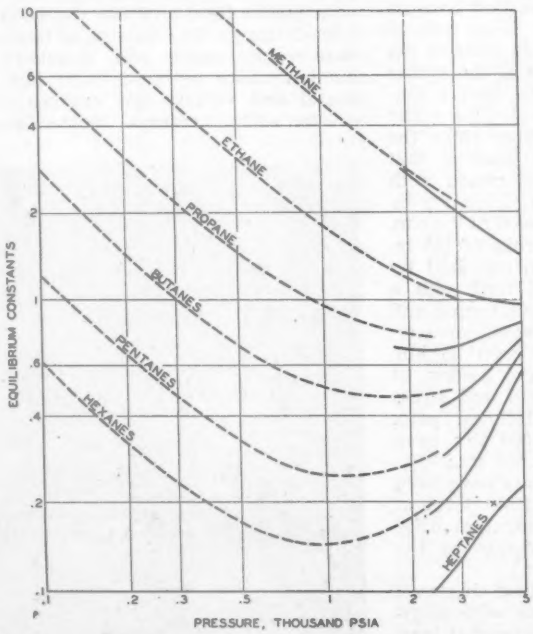


Fig. 17-2—Equilibrium constants vs. pressure at 250°F., dashed curves, Katz and Hachmuth; solid curves, Standing and Katz for 49.9° A.P.I. oil and gas-oil ratio of 3,660 cu. ft. per bbl.

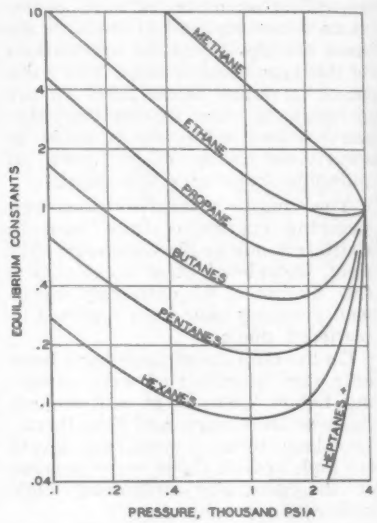


Fig. 17-3—Equilibrium constants vs. pressure at 200°F. for a condensate. Data by Roland, Smith, and Kaveler

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to reproduce by computation on observed bubble-point, or dew-point, pressure.

Cross-Plotted K Values

Equilibrium constants can be applied more conveniently if they are plotted by components against temperature for various pressures. Fig. 17-5 illustrates a portion of the Katz and Hachmuth data on hexanes. Fig. 17-6 illustrates a portion of the Roland, Smith and Kaveler data for hexanes.

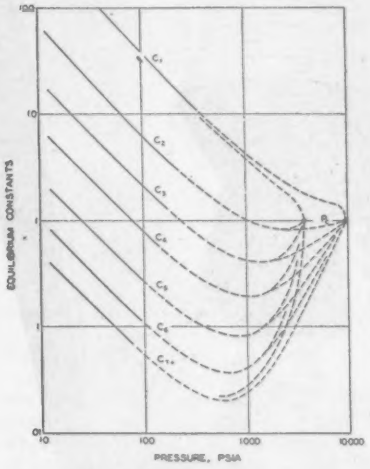

Fig. 17-4—Illustrating the effect of convergence pressure P_c on equilibrium constants at a given temperature

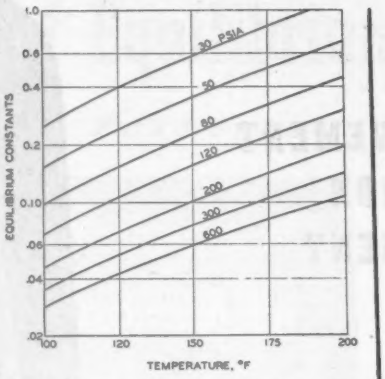

Fig. 17-5—Illustrating cross-plotted equilibrium constants for hexanes. Katz and Hachmuth data

Application of Equilibrium Constants

The practical approach to estimating phase behavior of reservoir liquid and gases is to use empirical-

TABLE 17-1—COMPOSITION OF PRODUCTION AND K VALUES

Constituent—	Mole (per cent)	K values for separator at 120 p.s.i.a. and 70° F.	K values for stock tank at 14.7 and 70° F.
Methane	47.73	29.1	240
Ethane	3.30	3.88	33
Propane	1.93	1.06	8.1
Butanes	1.72	0.353	2.65
Pentanes	1.22	0.104	0.76
Hexanes	1.67	0.0381	0.27
Heptanes+	42.43	0.00263	0.0177
	100.00		

Mol. wt. heptanes+ = 227.8 and Sp. gr. heptanes+ = 0.844

TABLE 17-2—COMPOSITION OF SEPARATOR GAS AND LIQUID AND G.P.M. OF GAS

	Assume: L=0.4945, V=0.5055				Assume: L=0.4944, V=0.5056		
Z	K	KV	L + KV	Z/(L+KV)=X	X	KX = Y	GPM
47.73	29.1	14.7	15.2	3.14	3.14	91.32	....
3.30	3.88	1.96	2.45	1.35	1.35	5.21	....
1.93	1.06	0.536	1.031	1.87	1.87	1.99	....
1.72	0.353	0.178	0.673	2.56	2.56	0.90	0.29
1.22	0.104	0.0526	0.5471	2.23	2.23	0.23	0.08
1.67	0.0381	0.0193	0.5138	3.25	3.25	0.12	0.05
42.43	0.00263	0.0013	0.4958	85.56	85.60	0.23	0.12
				99.98	100.00	100.00	0.54

Assume mol. wt. C_{7+} = 114 and Sp. gr. C_{7+} = 0.706

TABLE 17-3—COMPOSITION OF OIL AND TANK VAPORS AND G.P.M. OF VAPORS

	L = 0.9519, V = 0.0481				L = 0.9521, V = 0.0479		
Z	K	KV	L + KV	Z/(L+KV)=X	X	KX = Y	GPM
3.14	240	11.5	12.5	0.25	0.25	60.6	....
1.35	33	1.59	2.54	0.53	0.53	17.6	....
1.87	8.1	0.390	1.34	1.40	1.40	11.3	....
2.56	2.65	0.127	1.079	2.37	2.37	6.28	2.02
2.23	0.76	0.0365	0.988	2.26	2.26	1.72	0.62
3.25	0.27	0.013	0.965	3.37	3.37	0.91	0.37
85.60	0.0177	0.00085	0.9388	89.84	89.82	1.59	0.81
				100.03	100.00		3.82

M_{7+} = 114 and S_{7+} = 0.706

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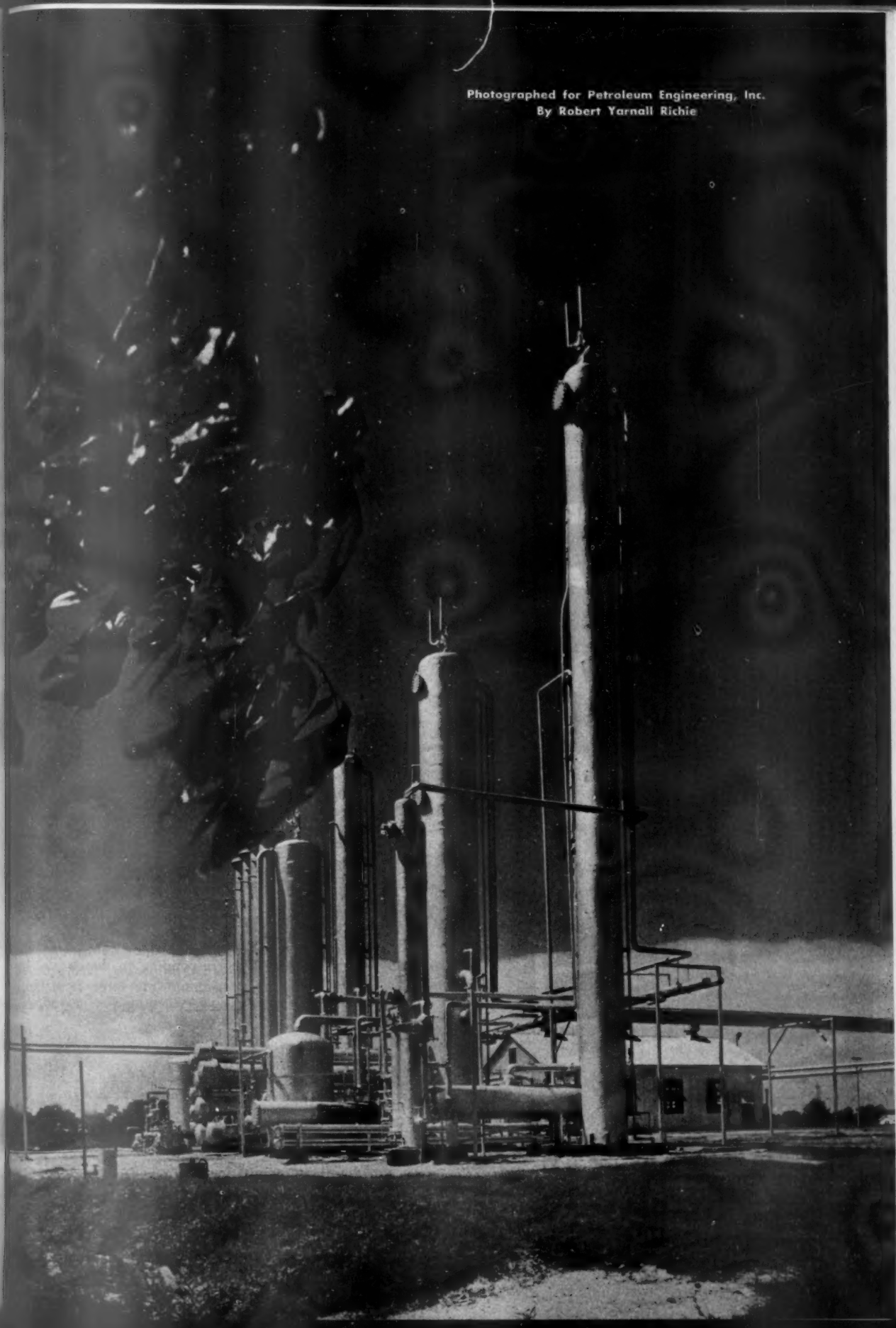

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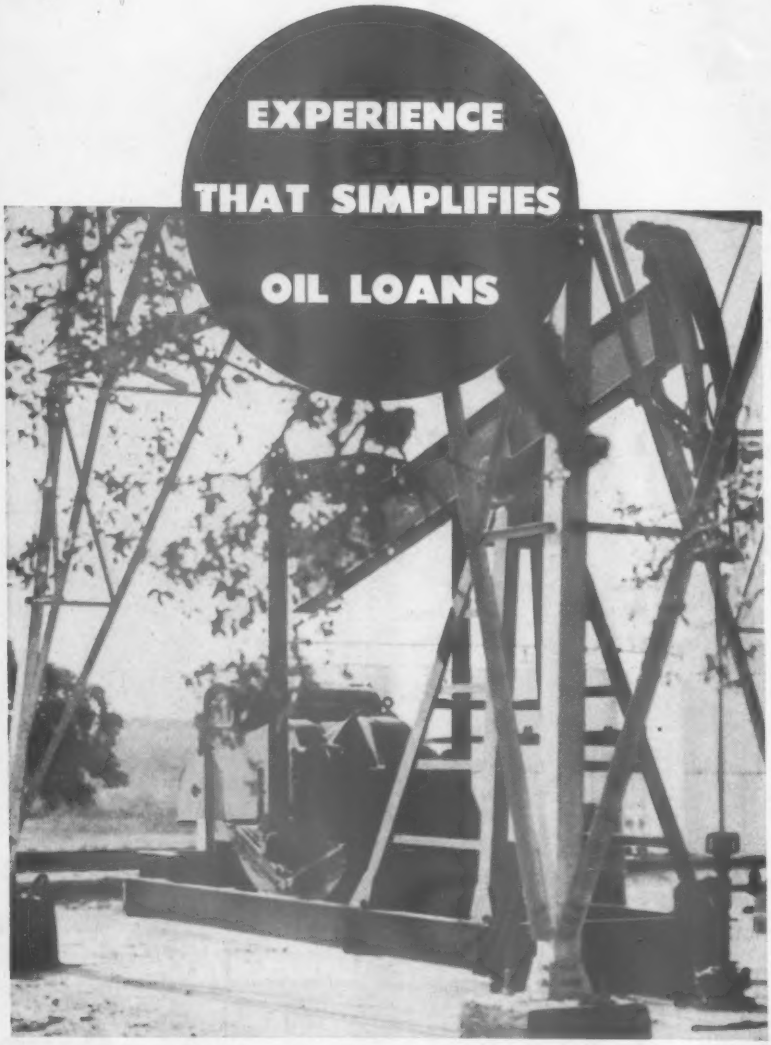

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ly determined K values. For example, let:

X = mole fraction of a component in a liquid phase

Y = mole fraction of coexisting gas phase

Z = mole fraction in the corresponding composite

L = mole fraction of liquid phase

V = mole fraction of gas phase

K = Y/X = equilibrium constant for a component

$\Sigma Z = 1$ = one mole of composite

then by trial methods the following may be computed:

1. The bubble-point pressure is the pressure corresponding to which

$$\Sigma KZ = 1 \qquad (2)$$

2. The dew-point pressure is the pressure corresponding to which

$$\Sigma Z/K = 1 \qquad (3)$$

3. The compositions and mole fractions of a liquid phase in equilibrium with a gas phase are determined by finding those values of L and V corresponding to which

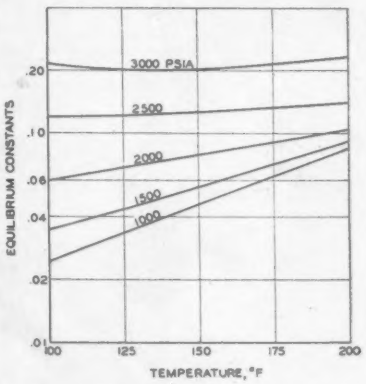

Fig. 17-6—Illustrating cross-plotted equilibrium constants for hexanes. Roland, Smith, and Kaveler data

$$\Sigma \left(\frac{Z}{L + VK}\right) = \Sigma x = 1 \qquad (4)$$

or

$$\Sigma \left[\frac{Z}{(L/K) + V}\right] = \Sigma y = 1 \qquad (5)$$

An illustrative application of K values will now be made to separation of oil and gas.

Computation of a Gas-Oil Ratio

The gas-oil ratio for a given production from a well can be calculated if the composition of the production and the K values for

the production are known. Table 17-1 shows the composition from a well and the K values[3] at separator conditions and stock-tank conditions.

The first step is to calculate the composition of the separator gas and liquid, as shown in Table 17-2. By trial, it was found that the mole fraction of the separator liquid is between 0.49 and 0.50. So another computation was made for a mole fraction of separator liquid equal to 0.4945. This was then adjusted to 0.4944. The corresponding composition of the separator gas and its gallons per minute are shown in the last two columns.

TABLE 17-4.—COMPUTATION OF SEPARATOR GAS-LIQUID RATIO

Mole %	× MW	÷ Lb./bbl.	= Bbl./100 moles
3.14	16	105	0.5
1.35	30	132	0.3
1.87	44	178	0.5
2.56	56	201	0.7
2.23	72	220	0.7
3.25	86	232	1.2
85.60	227.8	296	65.9
100.00			69.8 bbl.

69.8 × 0.4944 = 34.5 bbl. separator liquid/100 moles of composite
379 × 100 × 0.5056 = 19,200 cu. ft. separator gas/100 moles of composite
Separator gas-liquid ratio = 19,200/34.5 = 557 cu. ft./bbl.

TABLE 17-5.—COMPUTATION OF GAS-OIL RATIO

Mole %	× MW	÷ Lb./bbl.	= Bbl./100 moles
0.25	26	105	....
0.53	30	132	0.1
1.40	44	178	0.3
2.37	56	201	0.7
2.26	72	220	0.7
3.37	86	232	1.3
89.82	227.8	296	69.1
100.00			72.2 bbl.

72.2 × 0.9521 × 0.4944 = 34.0 bbl. oil/100 moles of composite
34.0/34.5 = 0.986 bbl. oil/bbl. separator liquid
379 × 100 × 0.0479 × 0.4944 = 898 cu. ft./100 moles of composite
898/34 = 26 cu. ft. tank vapors/bbl. oil
557/0.986 = 565 cu. ft. separator gas/bbl. oil
Gas-oil ratio = 565 + 26 = 591 cu. ft./bbl.

The second step is to calculate the composition of the oil and tank vapors, as shown in Table 17-3. The separator gas-liquid ratio and the gas-oil ratio are obtained then as shown in Tables 17-4 and 17-5 respectively.

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3. Katz and Hachmuth, I.E.C., 1937, Vol. 29.
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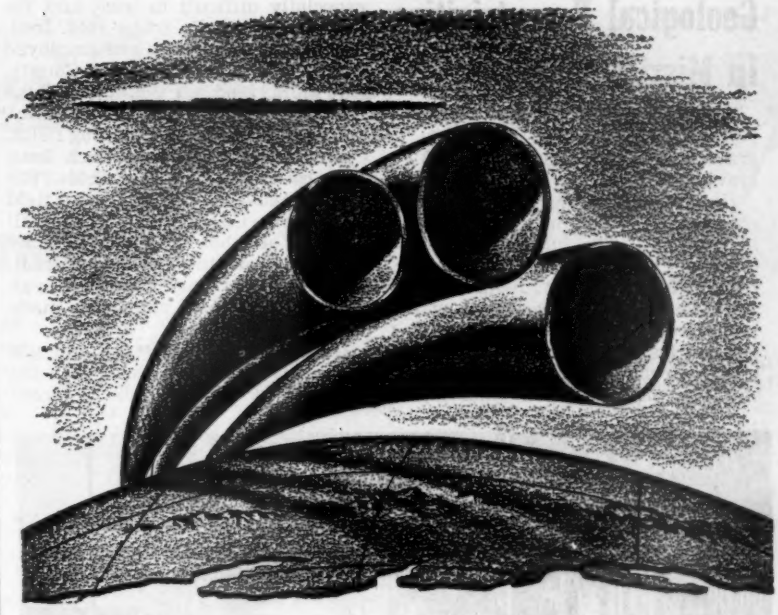

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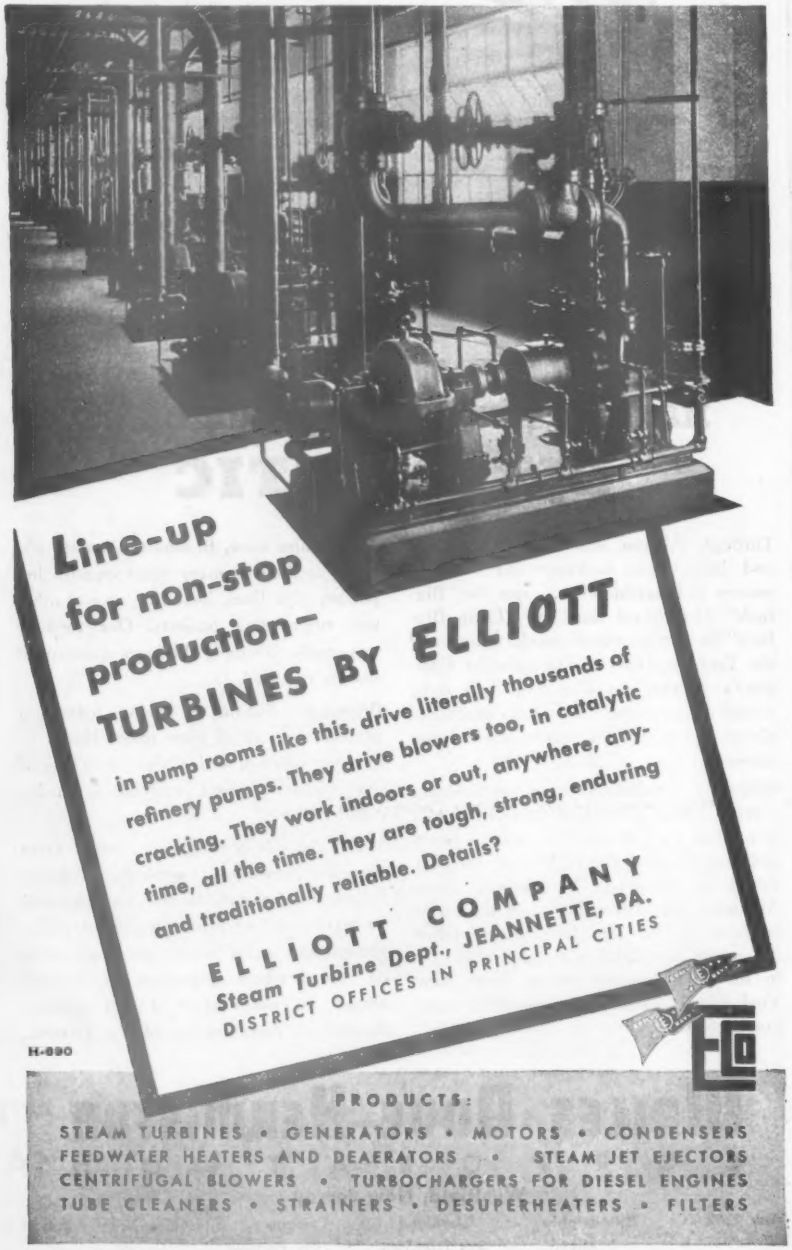
Geological Eccentricities In Mississippi

(Continued from page 129)

gravity. Eutaw at Langsdale is 18.1° gravity.

Heidelberg and Eucutta fields are characterized by low pressures and lack of gas. The oil is undersaturated and gas recovery is barely sufficient for pumping requirements and treater fuel. Nearly all wells pump from the start and make water and b.s. in varying percentages, usually from 3 to 15 per cent. The emulsion, particularly at Eucutta, is especially difficult to treat and the oil hard to handle when cold. Individual pumping units are employed exclusively, Carey, Sharkey County, and Flora, Madison County, and the new Langsdale field, Clarke County, are also low-pressure pumping fields. Only one or two wells each have been completed in these fields. The deep, Massive-sand Brookhaven field in Lincoln County also has small pressure and has been produced by pumping from the beginning. In it, however, only one producing well has been completed and it has made considerable water.

More favorable pressure and gas conditions exist in nearly all the other fields. Such fields as Cranfield, Carthage Point, Gwinville, and Baxterville, all deep fields, have definite gas-cap areas of sizable extent. Oil production in these fields is found down structure around the rim of the gas cap. So far the only well at Carthage Point is a gas-condensate producer, which is believed to be in or at the edge of the gas-cap area. It is assumed that oil production will be developed out from this. Mallalieu, one of the newer deep fields in the Massive sand, with only one well completed, as yet is without a known gas cap such as found at the above fields, but in it similar structural conditions are expected to be revealed with further development. Production in all these fields is flowing with gas-oil ratios of from 1,000 to 1,500 cu. ft. per barrel for wells in the oil zones.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BOOKS

GAS TURBINES AND JET PROPULSION FOR AIRCRAFT. By G. Geoffrey Smith. Aerosphere, Inc., 370 Lexington Avenue, New York. $3.

Due chiefly to developments traceable directly to the war or hastened greatly by its demands, the field of jet propulsion and of the gas turbine has taken on immensely added impetus. It now overshadows the subject of spark-ignition power plants, in the minds of forward-looking design engineers as well as the more commercially minded aircraft executives. This book, written by the managing editor of "Flight" and "Aircraft Production" (England), where much of this development has taken place, sums up in brief, succinct form the different types of engines and prime movers of the gas-turbine principle and indicates the probable direction of future development. The book gives especial attention to the work of R.A.F. Capt. F. Whittle, British engineer who first gave form to the gas turbine-jet propulsion assembly which bears his name; this is the principle which is being developed rapidly in this country under the guidance of General Electric engineers.

While not going deeply into the theory and engineering principles of jet propulsion, the book has an excellent presentation in the form of longitudinal cross-sectional drawings of numerous turbine developments, beginning with Swiss, German, and Italian designs. It discusses with drawings the designs of these various units and outlines their advantages and drawbacks. It gives a more detailed history of the Whittle developments which resulted in the British Air Ministry in the summer of 1941 disclosing developments to the U. S. Air Forces and the sending of the first successful plane to General Electric Co. Bell Aircraft was authorized to build an airplane suitable to utilize two of the Whittle units. The Bell plane was completed and flown first in October 1942, less than 6 months after the first American work was started.

The book goes into the practical science and engineering of the field to a degree which is very informative and satisfactory to the automotive and aircraft engineer who wishes to know the major principles involved without becoming entangled in the highly scientific and involved mathematical considerations of the research designing field. Seven pages are devoted to the flying-wing type of aircraft and discusses the scope of the field which is opened to forward-looking designers for postwar commercial development.

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Yields From Crude Oil

THE Refiner's Notebook Nos. 24 and 26 on Crude Distillation and Evaluation Curves are continued here for the determination of yields and value of products. Evaluation curves of a 37° A.P.I. paraffin intermediate base crude oil are shown on this page. One break-up of the crude oil is:

Raw Aviation Gasoline	13%
Naphtha	16
Kerosene	6
Diesel Fuel	16
Topped Crude	49

These yields were estimated as follows:

Gasoline.—The lead susceptibility of this stock is such that an undesulfurized clear octane number of 65 is necessary in order to make 87 octane with 4.6 cc. of TEL. The octane yield curve shows 13 per cent of raw 65-octane-number gasoline. Such a gasoline would have an A.P.I. gravity of about 67° which was obtained by reading the gravity mid per cent curve at 6.5 per cent and raising the gravity a little because the curves have a small upward curvature. The T.B.P. cut point at 13 per cent is about 262°F. which according to Fig. 1 of Refiner's Notebook No. 24 of December 30, 1944, would indicate an A.S.T.M. end point of about 275°F. Stabilization of the raw gasoline to reduce the vapor-pressure to 7 lb. will reduce the yield to 12 per cent or less.

Naphtha.—A 400-e.p. naphtha will have a T.B.P. cut point of about 415°F. (Refinery Notebook No. 24) which occurs at 29 per cent on crude oil. Thus the properties of a 16 per cent naphtha (29-13 per cent) will be: Gravity about 51°, octane number about 37 (read a little high because of curvature), and aniline point 115°F., all of these properties being read at 21 per cent on the crude oil.

	(%)	Gal./Bbl.	Ct./Gal.	Ct./Bbl.
Loss	1	0.4	...	...
87 Octane Aviation Gasoline	12	5.0	7.0	35.0
Third Grade Gasoline	16	6.7	5.25	35.2
Kerosene, 44 A.P.I.	6	2.5	4.5	11.2
Diesel Fuel	16	6.7	4.25	28.4
Topped Crude	49	20.7	2.5	51.8
Value of Products				161.6
Less cost of 37° A.P.I. crude delivered				125.0
Less cost of 4.6 cc. TEL/Gal. A. Gasoline				4.6
Less operating cost				13.0
Net profit and overhead				19.0
Loss	...	0.3	...	...
400 Gasoline, 70 Octane	28	11.8	5.875	69.3
Kerosene, 42° A.P.I.	10	4.2	4.375	18.4
No. 2 Distillate	15	5.0	3.625	18.1
Topped Crude	46	20.7	2.3	47.6
Value of Products				153.4
Less cost and gathering charge of crude				125.0
Less 3 cc. TEL/Gal. Gasoline				7.0
Less operating cost				12.0
Net profit and overhead				9.4

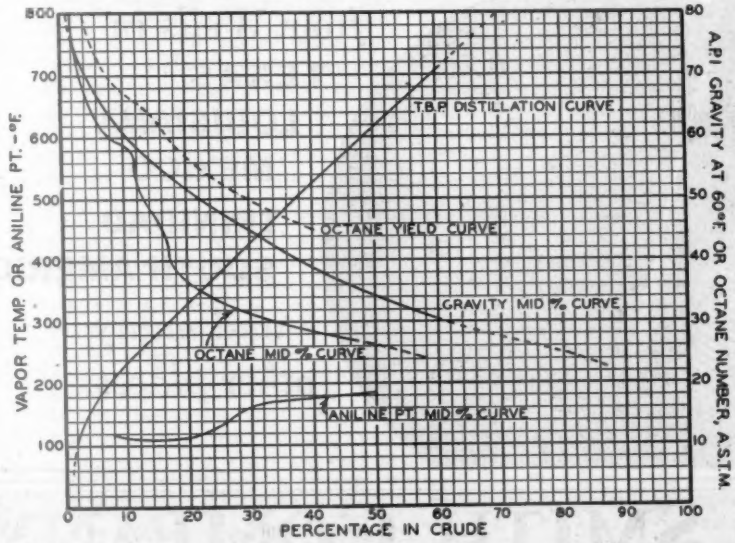


Fig. 1—Evaluation curves of a 37° A.P.I. paraffin intermediate-base crude oil

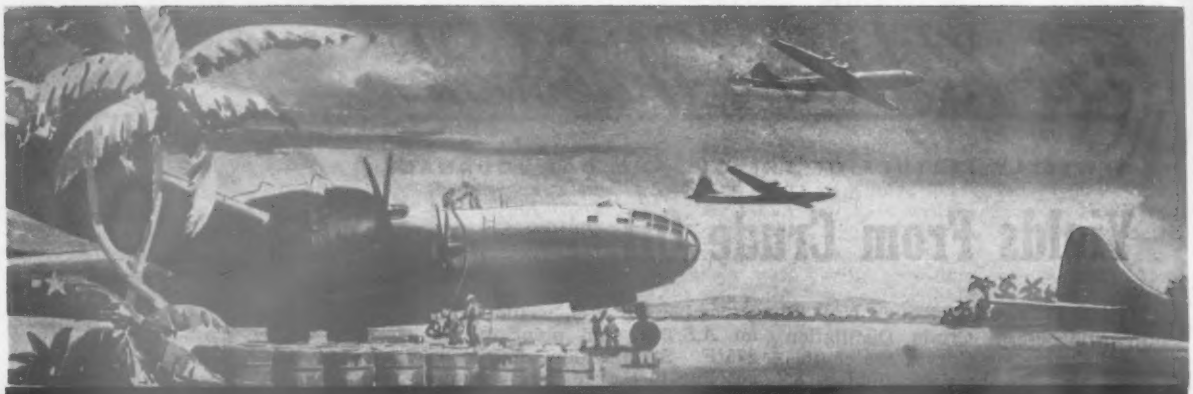
Kerosene.—This product is often sold on a basis of gravity and the yield of 44° A.P.I. kerosene is 6 per cent (32 minus 29 per cent times 2). The end point is about 460°F. (T.B.P. cut point of 476°F.).

Diesel fuel.—A 16 per cent yield would have a 90 per cent A.S.T.M. point under 600°F. and would have other properties read at 43 per cent on crude of 37.5° A.P.I., and 178°F. aniline point. The diesel index is the product of gravity and aniline point divided by 100, or 66.7.

Realization of Profits

The tabulation shows several break-ups such as that explained above. By using the plant operations costs of Refiner's Notebook No. 27 (January 27, 1945) and current prices of products and crude oil, it is possible to estimate the profit per bbl. of crude oil.

No. 31 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



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Engineering Fundamentals No. 174

A FEATURE OF THE OIL AND GAS JOURNAL

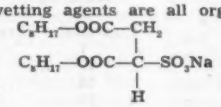
Wetting Agents*

IT has been known for some time that by adding certain chemicals to fluids, the surface tension of the fluid could be lowered. Such chemicals are called wetting agents because they increase the spreading and penetrating power of fluids. Livingston† found that the interfacial tension between oil and water could be lowered more than 50 per cent by the addition of wetting agents, as shown in Table 1.

TABLE 1—EFFECT OF WETTING AGENTS ON INTERFACIAL TENSION OF SALT WATER VS. PETROLEUM

Wetting agent—	Interfacial tension before treating, dynes/cm.	Mgr. added to 60 cc. sample	Interfacial tension after treating, dynes/cm.	Amount of lowering, dynes/cm.
W. A. Orvus flakes (a soap)	20	20	3	17
Sodium-B-sulfonaphalate	20	1	13	7
Phenyl-para-toluene sulfonate	20	1	14	6
Igepon A. P.	20	6	5	15
Phenol	20	6	10	10
Aerosol O. T.*	20	6	2.5	17.5

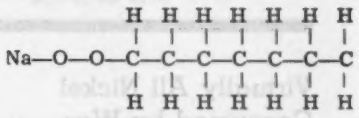
*These wetting agents are all organic compounds; aerosol, for example, has the formula:



The explanation which has been advanced to explain the part played by wetting agents in surface chemistry is interesting and helpful in an understanding of the highly technical process. The majority of organic compounds which are soluble in water have the property of attaining a greater concentration in the surface of an aqueous solution where the solution is in contact with air and vapor than in the solution as a whole. Certain long-chain, metallic organic compounds, like sodium oleate, $C_{17}H_{33}COONa$, have the property of orientation at the surface of the liquid in such a way that the sodium is attracted to the water phase and the long organic chain in the opposite direction.

These long ends of the molecules weigh down the surface film, reduce the surface energy, and lessen the surface tension. Livingston says a wetting agent possesses one or more groups of elements which are sympathetic toward water and antipathetic, i.e., antisympathetic, toward the vapor or air phase outside the water. For example, in an organic compound made of Na and a hydrocarbon chain like $NaCOO—C_{17}H_{33}$, the Na portion is sympathetic to the water phase, and the hydrocarbon is sympathetic to the vapor phase and antisympathetic to the water phase. Hence, orientation takes place at the surface.

DeGroote† explains that sodium oleate (a wetting agent having the formula $NaCOO—C_{17}H_{33}$) is a polar compound or one that is attracted to water molecules. When this compound is added to water in sufficient amounts, it is adsorbed at the surface, and the static surface tension of the water drops from 72 to about 36 dynes per cm. By polar compound, DeGroote means that the sodium oleate molecule is oriented in the surface of the water so that the sodium atom is immersed in the water and the fatty hydrocarbon chain projects outward. These projections of the long molecular chain,



etc., exert a force which counteracts the residual outside valences of the water molecules, and, therefore, the surface tension is reduced by one-half or more. Wetting agents in general, therefore, are metallic salts of long-chain or ring-shaped soluble hydrocarbons which have the power of polar orientation at the surface of water. DeGroote's theory is illustrated in Fig. 1.

The next articles will describe methods of measuring and demonstrating surface and interfacial tensions of fluids and applying these measurements to reservoir problems.

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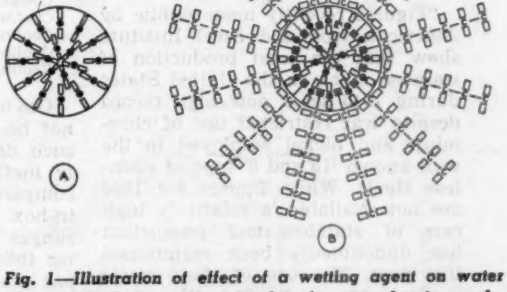


Fig. 1—Illustration of effect of a wetting agent on water films. "A," diagram of a droplet of water showing molecules of H O H arranged around the surface; "B," diagram of droplet of water with an organic compound of sodium added. The long molecule of the organic compound is absorbed by the water. The molecules at the surface are orientated with the sodium toward the water phase, and the organic part next to the air or vapor phase. The long, ponderous molecules of the sodium compound use up surface energy and depress surface tension. The diagram shows only a few molecules, actually there are millions of molecules in a droplet of water

*Numerous other terms are used by chemists to indicate substances used to reduce surface tension, such as surface-active substances, penetrants, capillary-active substances, assistants, soap, soap substitutes, and detergents.

†See reference at end of paper.

Series prepared by F. B. Plummer, professor, petroleum engineering school, University of Texas

PROGRESS IN METALS

by W. L. Nelson
Consulting Engineer

Virtually All Nickel Consumed by War

ACCORDING to news releases through Robert G. Stanley, chairman and president, International Nickel Co. of Canada, Ltd., the "demand for nickel continued strong during 1944 with virtually the entire production consumed in essential war waterial."

"While nickel supplied to the United Nations so far this year has been high, the total for the full year will not equal that of 1943," Stanley continued. "It will, nevertheless, be substantially larger than any peacetime year. Had it not been for the shortage of labor at the mines, absenteeism and the lowered efficiency resulting from the necessity of absorbing and training inexperienced labor, Canadian nickel production would have achieved a new record this year.

"It will be recalled that the importance of nickel made it one of the first metals to be put on a priority-control basis. The nickel requirements of the armed services, war production, and essential services have continued at a high rate and have absorbed virtually the entire nickel supply. Therefore, the release of any appreciable quantities of the metal for civilian purposes must await cutbacks from the present rate of war orders.

"Figures recently made public by American Iron and Steel Institute show that the total production of stainless steels in the United States during 1943 set a new high record despite war restricted use of chromium and nickel employed in the well-known '18 and 8' type of stainless steels. While figures for 1944 are not available, a relatively high rate of stainless-steel production has undoubtedly been maintained this year. The use of these steels is currently confined to the most essential of military requirements. The postwar era will no doubt see an even greater utilization of stainless steels, since their excellent mechanical properties as well as their corrosion resistance fit them into many industrial applications other than the decorative purposes which made them popular during prewar years.

"The wide acceptance of the NE steels has made nickel of much broader usefulness to the United Nations' war effort. Through them it was possible to apply the metal to a substantially larger steel tonnage to meet the requirements of the Allies. Enlarged utilization of the nickel - chromium - molybdenum alloy steels, including some of the NE types, is expected in the postwar era."

Corrosion-Resistant Metals

IN most heat-exchanger installations of the oil industry, the fouling or dirtying of the metal surfaces is the main hindrance to the transfer of heat. The degree to which these films of dirt contribute to low transfer rates is indicated in the following tabulation (computed from Chapter 21 of Petroleum Refinery Engineering, McGraw-Hill Book Co., Inc., New York).

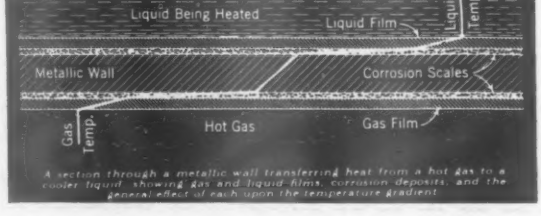
	Trans. rate, B.t.u./sq. ft. -°F.-hr.		Efficiency (per cent)
	Customary	If really clean	
Coil-in-box equipment:			
Vapor cooling	7	8- 9	78-87
Condensing and cooling naphtha	19	31-44	43-61
Cooling naphtha	13	28-39	46-64
Cooling kerosene and gas oil	17	26-35	48-65
Cooling lubes	12	16-19	63-75
Cooling tars and bottoms	10	12-14	71-83
Condensing kerosene	24	46-86	28-52
Condensing gas oil	22	39-65	37-62
Tubular equipment:			
Condensing naphtha with water	63	72-1160	5-74
Condensing naphtha with oil	29	34- 133	22-85
Condensing kerosene with water	48	68- 500	9-70
Condensing kerosene with oil	24	28- 67	36-86
Cooling naphtha with water	57	80- 670	8-71
Cooling naphtha with oil	20	26- 36	55-77
Cooling kerosene with water	37	46- 160	23-80
Cooling kerosene with oil	22	25- 43	51-88
Cooling fuel oils and lubes with water	19	24- 54	35-79
Cooling fuel oils and lubes with oil	15	18- 31	48-83

Obviously, such information cannot be accurate but it is given in such detail to indicate how grossly inefficient are dirty surfaces as compared with clean ones. In coil-in-box equipment the efficiency ranges from 28 to 83 per cent, and for tubular equipment only 5 to 88 per cent. Manufacturers of tubular equipment need not be concerned because the efficiency of tubular equipment appears to be low. This is due to the fact that these equipments are so well built that they give very high transfer rates when clean, and therefore a small or moderate film of dirt greatly reduces the clean transfer rate.

In many services the fouling is caused by dirt, debris, sediment, etc., carried by the liquids. Nevertheless, many of the excessively severe cases of fouling are caused by corrosion and by rusting. The degree to which corrosion or rusting contributes in an indirect way to the accumulation of pipe or tube scale by catching or entrapping particles from the liquids, cannot be stated but undoubtedly this effect is not a minor one.

Without experimental information the true economic position cannot be ascertained but it would seem that expensive corrosion-resistant metals would be justified for many services, particularly tubular water-cooled condensers and boilers. For the worst cases, the amount of condensing surface required might be cut to one-fourth. In addition to such heat economy could be added the longer useful life of the corrosion-resistant equipment. Such metallic materials as stainless steel, monel metal, Inconel, cupro-nickel, nickel silver, and various "clad" steels might be of service. There is need for experimental data. Advertisements of International Nickel Co. indicate that this company is aware of the possibilities of avoiding scale by the use of corrosion-resistant metals. The possibilities would appear to be very good in some phases of the chemical industry where really clean liquids are processed. The same would apply in part to developments in the oil industry of chemical manufacture.

Corrosion-resistant materials might also allow the use of vigorous chemical agents for cleaning debris from the equipment.



A section through a metallic wall transferring heat from a hot gas to a cooler liquid, showing gas and liquid films, corrosion deposits, and the general effect of each upon the temperature gradient

Proposed Exploratory Work Would Help Determine Extent of Elk Hills Reserve

by L. P. Stockman

The Navy will shortly seek funds for the drilling of some 37 wells on 23 different sections in the Hillcrest area at the west end of Reserve 1. Preliminary plans contemplate the drilling of one shallow-zone well and one deep-zone well on each section, the object of which is the actual determination of Elk Hills reserve.

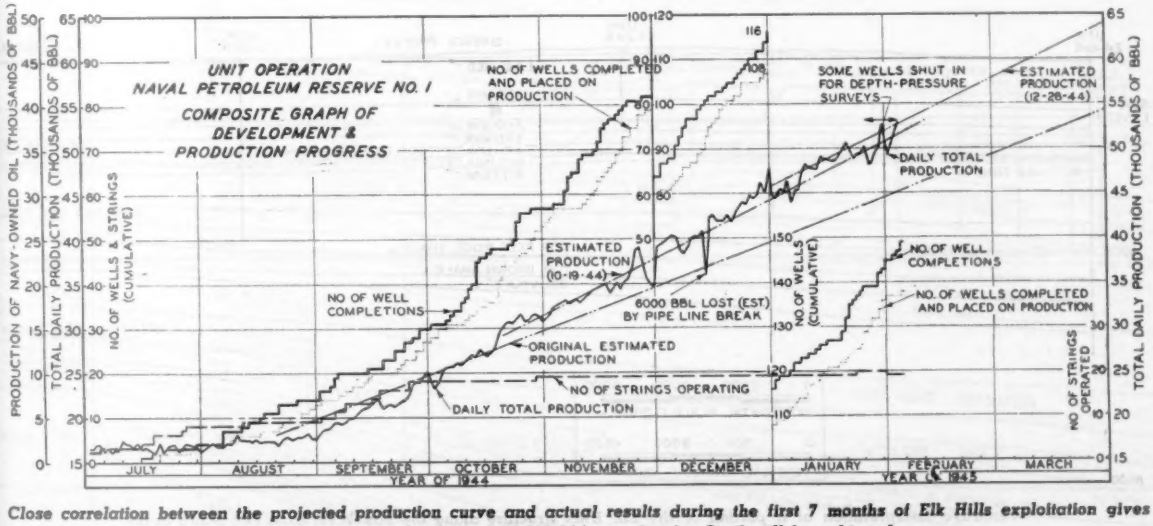
Acknowledgment is made of the assistance rendered by Navy personnel, both oral and written, in assembling this material and for permission to publish the article. The assistance of Standard Oil Co. of California is also acknowledged.

THE largest undeveloped reserve in California at the present time is located in the Elk Hills district of Kern County, a prominent topographic feature of the San Joaquin Valley about 10 miles northeast of the town of Taft and approximately 20 miles southwest of Bakersfield, the county seat. By executive order of President Taft in September, 1909, this land was removed from entry and Naval Petroleum Reserve was created in 1912. Previously, Southern Pacific Railroad had received title to every alternate section of land along its right-of-way from the federal government. Standard Oil Co. of California came into possession of certain acreage at Elk Hills when it acquired all mineral bearing land of the Southern Pacific and in addition acquired certain school lands which had come into private ownership. This explains how Standard of California became interested in this reserve. Because of the withdrawal order only a limited amount of drilling has been done within the reserve and consequently very little is known about the tremendous productive possibilities of the area of more than 43,000 acres.

The Navy's petroleum reserves consist of No. 1 at Elk Hills in California; No. 2 at Buena Vista Hills, California; No. 3 at Teapot Dome in Wyoming, and No. 4 in Alaska. The contract establishing the unit plan of operation for Reserve 1 at Elk Hills between Navy and Standard of California was dated June 19, 1944, and set up the machinery for the unification and operation of this reserve. The operating committee, consisting of one member representing the Navy and one representing Standard of California, is charged with the responsibility of supervising all drilling, production, prospecting and exploration work. Standard's representative is Victor O. Wankowski and Capt. Harry P. Stolz, USNR, represents Navy. The operating committee passes its orders to the superintendent of the unit who in turn sees they are carried out.

The contract was the outcome of extended negotiations and resulted from the fact that Standard of California controlled one-third of the productive or potentially productive acreage and Navy controlled two-thirds. The participating percentages were determined by an engineering committee of six men. Standard of California's representatives are Earl Gaylord, Victor O. Wankowski and C. R. Burgess. Navy's representatives are Capt. V. H. Wilhelm, USNR, Lewis MacNaughton of the firm of DeGolyer and MacNaughton, consultants to the Navy Department, and Captain Stolz.

In development of the shallow zone, the basic percentages of reserves are about one-third to Standard and two-thirds to Navy. Standard is being permitted to withdraw 15,000 bbl. per day which will be deducted from its participating share in the shallow zones. These withdrawals, however, are limited to not more than one-third of its interest in the reserves of the shallow zones. During shut downs, Standard will be permitted to produce only enough oil or other hydrocarbons to pay local taxes and its share of the operating costs of the field. By virtue of the control vested in the Secretary of Navy practically all of



Close correlation between the projected production curve and actual results during the first 7 months of Elk Hills exploitation gives assurance that the goal of 65,000 bbl. per day by April will be achieved

Standard's oil can be kept in the ground indefinitely as a Naval Reserve during times of peace and controlled in time of war or other emergency.

Geology of Elk Hills

Naval Petroleum Reserve 1 comprises approximately 43,000 acres at the southwest edge of the San Joaquin Valley. The main structural feature is the Elk Hills anticline. The structure is an elongated dome about 17 miles long and 6 miles wide. The beds forming the structure have been warped upward into their present form. Except for the uppermost 1,000 ft. of sediments, these beds were deposited horizontally on the bottom of a fairly shallow sea but the type of sediments laid down at this location varied considerably during geologic time. During some periods, very fine types of material were deposited and at others they were of a coarser texture, the former forming the shales and clays and the latter forming the silts and sands. It is in this latter type of sediment that the main production of oil and gas is obtained.

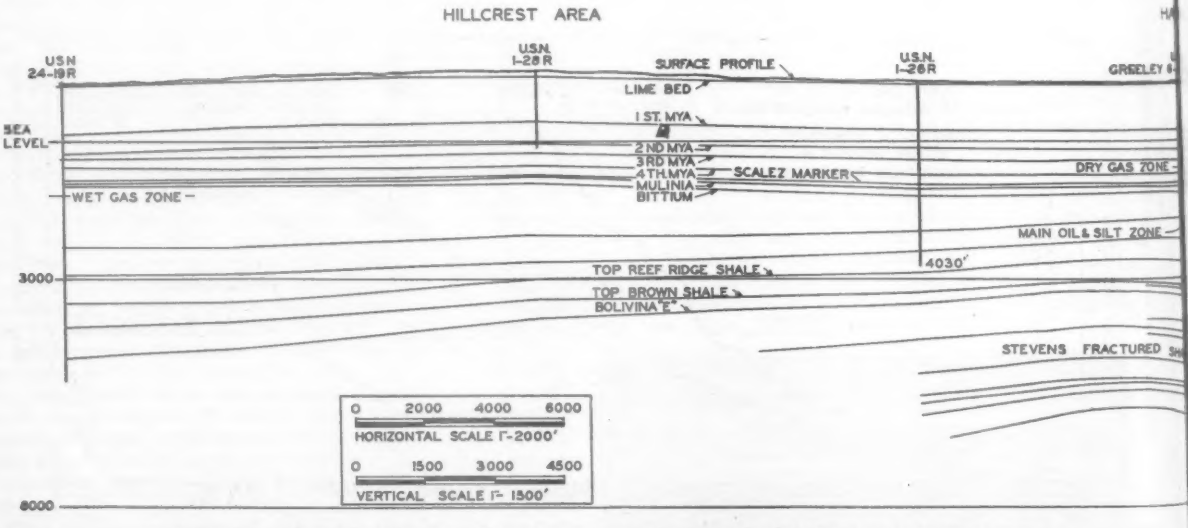
The beds now exposed at the surface express to a fair degree the characteristics of the structure at depth. Oil and gas have accumulated in the higher structural positions in the coarser deposits or sands underlying the Elk Hills anticline. The highest stratigraphic productive horizon encountered is the Mya dry gas zone of the Etchegoin group of Pliocene age which is productive of gas only. This gas comes from sands developed in the San Joaquin Clay formation between depths of 1,000 and 2,000 ft. This zone is considered one of the largest potential sources of dry gas in the San Joaquin Valley. The main shallow-oil-zone production, now being exploited, has accumulated in sands at the very base of the San Joaquin Clay and at the top of the next oldest underlying formation. This interval encompasses a zone averaging about 300 ft. in thickness and is found between depths of 2,300 ft. to 3,400 ft. depending upon the position of the sand on the structure. The upper zone has been named the Scalez and the lower zone, the Mulinia sand.

Within the shallow zone, the Scalez and Mulinia sands have been broken down into the Above Scalez sand (AS), the Sub-Scalez-1 sand (SS-1), the Sub-Scalez-2 sand (SS-2), the Mulinia sand (M), and the Sub-Mulinia sand (SM). These sands are of variable thickness throughout the structure. In the development of the shallow zones in the field, a differentiation has been made between sands. Although a map will show a 10-acre spacing pattern, actually alternate wells are completed in the Scalez and Mulinia sands, resulting in a subsurface pattern of one well to each 20 acres.

The deepest and oldest beds which have been produced up to the present time are those of upper Miocene age between depths of 5,000 and 7,000 ft., the equivalent of the Stevens sand. Eight wells, all in the east half of the reserve, have been drilled to this zone. Two are producing from the upper Stevens sandy zone and one from the lower Stevens fractured chert zone, the balance being shutin. The areal extent and productivity of the Stevens zone, which has shown prolific production in other San Joaquin Valley fields, have not been delineated in the reserve. The possibilities of deeper sands have not been fully explored although one well has penetrated below the Stevens zone through rocks of Miocene age. Sands encountered in this well were too tight to produce. This same sand zone as well as sands in the older Oligocene and Eocene beds which are believed to underlie the reserve have been explored in wells drilled in several other San Joaquin Valley fields.

Will Seek Appropriation

The Navy will soon ask the House Naval Affairs Committee to appropriate funds for the drilling of about 37 exploratory wells on 23 different sections in the Hillcrest area at the west end of Reserve 1 which is still virgin territory. This proposed exploratory work would encompass that area west and northwest of present production, along the axis of the Elk Hills structure. This projected program has not yet been fully developed but preliminary plans contemplate the drilling of one shallow zone well and one deep zone well on each section if this proves feasible. The object of this exploratory work is the actual determination of the Elk Hills reserve. Captain Stolz has also recommended that considerable reconditioning work be undertaken on old wells and that additional exploratory wells be drilled to definitely outline the limits of the shallow zones. Secondary recovery practices must also be prosecuted to effect the greatest ultimate recovery. Little is known of the Stevens sand of Miocene age and much must be learned of the second, third and fourth Mya dry gas sands as well as the infinite production possibilities between the shallow and deep zones, not to mention productive possibilities below the Stevens and down into the Eocene. An appropriation already has been made available to acquire private interests of B. & M. Oil Co., Richfield Oil Corp. and Union Oil Co. and when the transfer of own-



Tentative interpretation of a portion of the Elk Hills structure along the East-West axis. The North Coles Levee area and the eastern portion of the Tupman district have the same geological characteristics

ership takes place Navy will come into possession of the entire Elk Hills structure.

Crude Oil Reserve Data

Captain Wilhelm recently told a Congressional committee that the engineering committee which was charged with the responsibility of determining as far as possible the crude-oil reserve underlying Standard of California's land as well as Navy's part of the shallow zones started active work within 30 days after the contract had been signed. The engineering committee reported December 9, 1944, that the recoverable oil reserve under the old area as of November 20, 1942, was estimated at 45,000,000 bbl., of which 38,000,000 bbl. should be produced by present wells and of which 7,000,000 bbl. should be obtained through necessary remedial work, deepening oil wells and the drilling of new wells. In analyzing production from present wells, a chart was constructed which showed production per well per day of operation versus cumulative production from November 20, 1942. A curve was then drawn on the decline in past daily production and extrapolated to an economic limit of 5 bbl. of oil per well per day at which point the cumulative production amounted to 38,000,000 bbl.

In the new area, a volume of 367,263 ft. of productive sand was calculated from the composite isopachous map of all lands in the shallow zone. Core analyses showed the porosity of the productive sands and the connate water contained therein to be sufficiently consistent throughout the new area to permit use of a constant figure for the recovery per acre-foot. After consideration of the available reservoir date, it was estimated that the recoverable reserve per acre-foot of sand as of November 20, 1942, approximated 650 bbl. of oil. Based on these two factors, the recoverable reserves under the new area is estimated at 238,000,000 bbl. of oil as of November 20, 1942. Based on the foregoing, the engineering committee determined the number of barrels of estimated recoverable oil within the estimated limiting line of commercial productivity for the shallow zone as 283,000,000 bbl. as of November 20, 1942. The above indicates Standard of California will receive 25,000,000 bbl. of oil before it has withdrawn its one-third of reserves from the field.

Drilling Practice

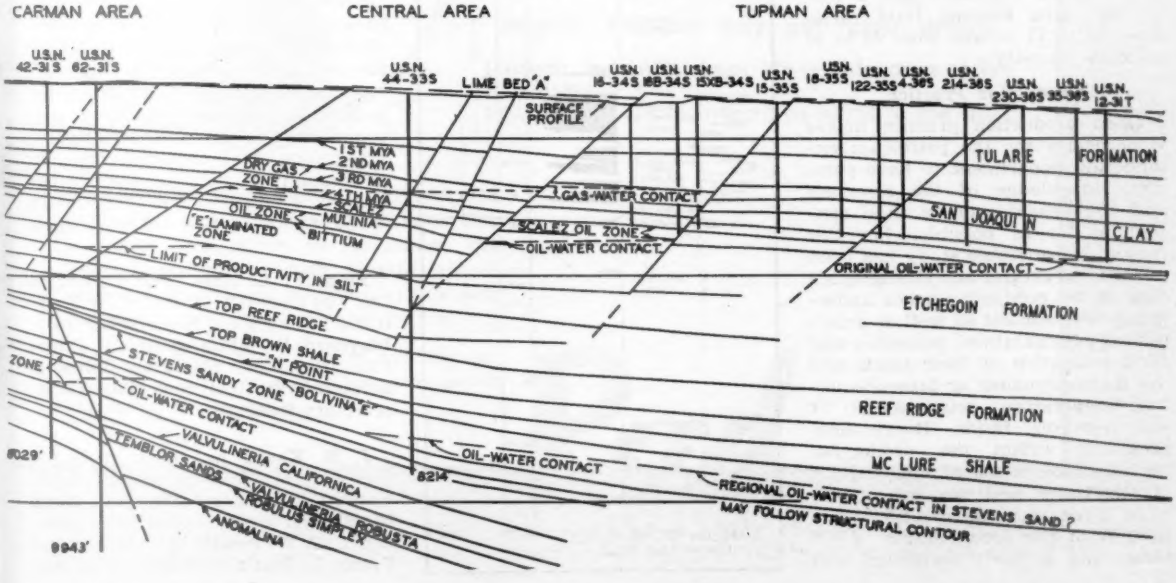
Considerable difficulty has been experienced from time to time because of the complexity of the Elk Hills structure due to the pinchout of sands and faulting with the result that engineers have been obliged to rely on known data from wells previously drilled and attempt to interpolate and correlate toward the unknown areas on the structure. In the eastern end of the field, where considerable drilling has taken place, the problem is simpler than in the west end where subsurface data are practically nonexistent. A total of 147 wells have been drilled to date, 2 of which have been abandoned. One well encountered faulting and one well found the Scalez and Mulinia wet. In the present development program, it is the practice to core analyze a minimum of one well to each quarter section of 160 acres. When this development work has been completed, the Navy will have a complete picture of subsurface conditions because this study will provide the basis for development of excellent data on porosity, permeability, oil saturation, interstitial or connate water content and other physical measurements.

All drilling is done with rotary tools by independent drilling contractors who at present are running 20 strings of tools. Contractors drill down into the pay, land pipe and run tubing on the completion of which their activities end. Completion crews, of which there are 19, then take over and install pumping equipment and finish the well. This practice has been adopted as an efficiency measure as it is vital that all drilling equipment be employed for drilling purposes exclusively and not tied up while pumping equipment is being installed. Completion crews use portable equipment which permits movement from one location to another with the least possible delay.

Average Drilling Time

Average drilling time from spudding to the time a well is turned over to production crews is about 15 days. Subsurface formations are soft, permitting fast digging and there are no special problems with which to contend. Actual time with bit on bottom is less than 5 days and some wells have been drilled with as few as two rock bits after surface pipe has been landed. The remaining time is consumed in coring, cementing, surveying, waiting for cement to set, water shutoff test, time required to run and pull drill pipe, running tubing and dismantling equipment. No time is lost in checking water shutoff because if no representative of the California Division of Oil and Gas is present, the test is witnessed by one of the Navy personnel.

Because most of the contractors



use portable rigs, the only surface equipment visible at a completed well is the pumping unit and auxiliary facilities. All incoming drilling and production equipment is stocked at Standard's 11-C camp outside Taft. This yard is located on a rail spur which facilitates unloading of cars which deliver casing and other heavy equipment. Standard also has a salvage depot at the 11-C camp at which can be secured replacements for broken or worn equipment for use at Elk Hills. Casing, pumping units and other equipment are transported from the 11-C camp to Elk Hills by trucks.

Practically all drilling since the start of unit operation of Elk Hills in June 1944, has been confined to the so-called shallow zones in proved locations in the east end of the field. This has been done in order to expeditiously meet the production quota.

The casing program varies somewhat from well to well, the 200 ft. of surface casing ranging in diameter from 10¾-in. to 11¾-in. 42-lb. or 13⅜-in. 54-lb. pipe. Wells, as a rule, are completed with 7-in. 20-lb. casing containing 60-mesh perforations opposite the oil sand and cemented through perforations above the pay. This eliminates the necessity of running a liner. Holes are usually started with 16½-in. bits and finished with 9⅞-in. on 4½-in. drill pipe. Some slight variations are possible as much depends upon the availability of equipment. Rock bits are used throughout the field. Very few holes are more than ½° off vertical. Speed of the rotary table may vary between 75 r.p.m. and 150 r.p.m. and not more than 2 tons weight are carried on the bit. The general practice is usually about 1 ton weight on the bit at 75 r.p.m. of the table and 2 tons at 150 r.p.m. Drilling fluid varies from 70 to 75 lb. and from 40 to 50 seconds viscosity.

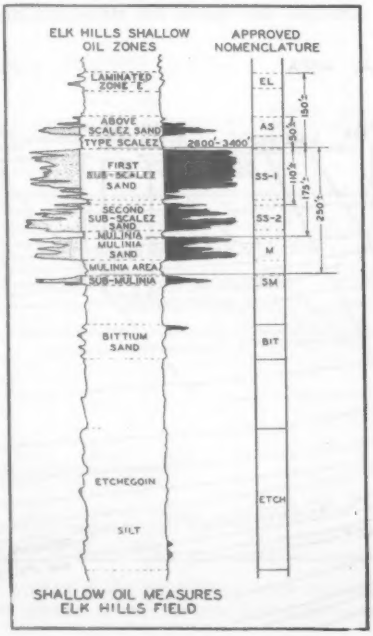
Production Practice

Good production practice makes it necessary for the petroleum engineering department to have complete knowledge of the reservoir and the behavior of its fluid content as far as possible. For this reason, considerable study has been given to structural and stratigraphic data of the productive zones undergoing development as well as determining permeabilities, porosities and fluid saturation of their sands and the thermodynamic or pressure-volume-temperature relationships of the reservoir fluids. Bottom-hole pressures within the productive horizons and location and activity of edgewater and gas cap movement have received careful attention. With the accumulation of all these data properly correlated and interpreted, the engineering department makes definite recommendations to the production and maintenance crews regarding the proper rates of fluid withdrawals from particular wells or areas at Elk Hills. Decision has been reached to inject natural gas back into the formations and it is necessary to plan ahead and select the most favorable locations and wells. Because Elk Hills is being operated as a single unit, all questions of drainage have been correlated and property lines as such have ceased to exist.

The practice at Elk Hills is to install 2-in., 2½-in., 2⅞-in. or 3-in. tubing in completed wells depending upon the estimated rate at which the well will be produced. Pumping equipment consists of standard rod pumps activated by gas engines which use natural gas produced at each well. Surplus gas is moved by pipe line to a general gathering system for subsequent processing at natural-gasoline plants. Because of high fluid levels and average porosities as high as 35 per cent, slow pumping speeds are the rule.

New Plant Started

In order to start repressuring the shallow zones at Elk Hills, construction has been started on a new absorption and compressor plant. A completely independent plant is being erected next to the present natural-gasoline plant. The repressuring plant will include five 300-hp. Ingersoll-Rand compressors and all practical safety and automatic control features will be incorporated within the new plant. With the aid of engineers of the natural-gasoline department of Standard of California, plans have been completed and construction work has already started. Natural gas is taken off the wells at approximately 6 in. of vacuum and will be reintroduced into the zones at properly located injection wells at pressures ranging up to 800 p.s.i. Experimental repressuring work started some time ago with gas being injected into well 85-33-S at approximately 150 p.s.i. This gas is coming from the absorption plant now in operation where at present 6,500,000 cu. ft. is being handled per day. About half of this volume is being processed at the absorption plant from which is recovered approximately 3,600 gal. of natural gasoline daily. The repressuring plant will have facilities for handling 10,000,000 cu. ft. of natural gas at 800 p.s.i. Plans have been formulated whereby additional units could be installed at small cost to increase the capacity to 16,000,000 cu. ft. per day if desired.



All crude oil produced by Navy on the north side of Elk Hills gravitates to what has been designated as the 23S Booster Station where it is gathered in two 40,000-bbl. steel tanks and in turn shipped to Standard's Buena Vista tank farm which contains 51 steel tanks each with a capacity of 35,000 bbl. The Navy is using 17 of these tanks but has an option to use additional tanks if required. Oil produced on the south flank of the structure, gravitates directly into the Buena Vista tank farm. The balance of Navy's oil is shipped from 23S Station through 6¼ miles of 12-in. pipe line into the Buena Vista tank farm. Present pump capacity at the Buena Vista tank farm which delivers crude to the purchasing companies is 60,000 bbl. daily. The 23S Station on the north flank of the structure is equipped with six Gardner-Denver pumps powered by six-cylinder, 115-hp. Caterpillar engines. Each pump has a maximum capacity of 450 bbl. per hour.

Acknowledgment is made of the assistance rendered by Navy personnel, both oral and written, in assembling this material and for permission to publish same. The assistance of personnel of Standard of California is also acknowledged.

Stanford L. Rose, The California Co., was elected president of Ardmore (Okla.) Geological Society for 1945; **Maynard P. White,** Gulf Oil Corp., vice president; **Hamilton Johnson,** Schlumberger Well Surveying Corp., secretary-treasurer.

J. R. Keane has been reelected president of Western Asphalt Association. **J. R. Pemberton** and **Rush M. Blodget** were elected vice presidents. **C. W. Powell** is treasurer and **Frank L. Mark** managing engineer.

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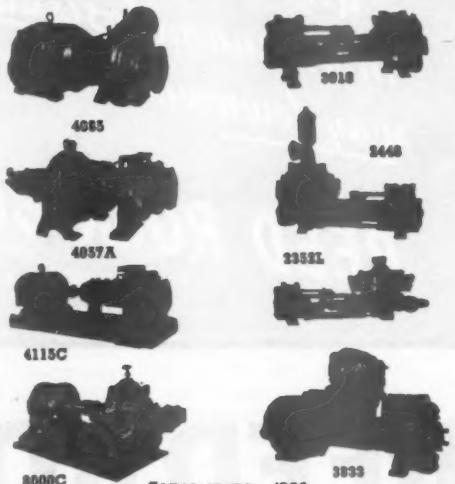

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Form Utility of Light Hydrocarbon Fuels

THE rapid development of the liquefied-petroleum-gas industry in the past decade from a sales volume of 76,855,000 gal. in 1935 to an estimated sales volume of 785,000,000 gal. in 1944 is a striking example of the economics of form utility-transportation, storage, and utilization.

Liquefied petroleum gases are segregated from either natural gas or refinery vapors by the application of various scrubbing and fractionation operations and are defined to include any material which is composed chiefly of any of the following hydrocarbons, or mixtures of them: propane, propylene, butane, and butylenes. For simplicity, the present discussion is being limited to propane and normal butane, whose physical behavior resembles that of the analogous hydrocarbons as far as form utility is concerned.

Natural gas, as produced in the oil or gas fields, unless devoid of commercial quantities of the intermediate hydrocarbons, including propane, butanes, and heavier, is subjected to various physical operations, such as absorption, compression, cooling and fractionation, by means of which the intermediate hydrocarbons are segregated and liquefied in the form of distillate, natural gasoline, or liquefied petroleum gases with occasional segregation of ethane either as a separate gaseous concentrate or in solution in the various extracted condensates. Thus, the natural gas in pipeline distribution systems is principally methane with a small percentage of ethane and minor percentages of propane and heavier. The following tabulation gives a typical composition of pipe-line natural gas:

	Gas volume (per cent)
Nitrogen, carbon dioxide helium, etc.	3
Methane	85
Ethane	10
Propane and heavier	2

From the foregoing, it is clear that the physical behavior of methane dominates the form utility of natural gas. For simplicity, the present discussion is being limited to methane, whose physical behavior resembles that of all pipe-line natural gas as far as form utility is concerned.

The chief characteristic that differentiates methane (as illustrative of natural gas) from propane and normal butane (as illustrative of liquefied petroleum gases) is that the critical temperature of methane (—116.5° F.)[1] is as far below atmospheric temperature as the critical temperatures of propane and normal butane (206.2° F. and 305.6° F.) are above atmospheric temperatures. Thus, while the liquefied petroleum gases assume the liquid state at atmospheric temperatures and moderate pressures, natural gas must be held far below atmospheric temperatures to assume the liquid state. At atmospheric pressure (760 mm.), methane must be at —258.5° F. to be liquid.

This basic property of methane relegates natural gas to the role of a fixed gas with all the economic limitations in respect to storage, transportation, and handling. For example, pressure vessels designed for the containing liquid butane at

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80 p.s.i.g. will hold about 120 times as many B.t.u.'s as when filled with methane at the same pressure. Similarly, propane storage vessels will hold about 47 times as many B.t.u.'s at 200 p.s.i.g. as is the case with methane compressed to the same pressure.

There is on record[2] only one large-scale commercial instance in which liquid natural gas has been handled and in this instance only the storage function was fulfilled. Three 17,300-bbl. spherical and one 31,300-bbl. cylindrical storage vessels were maintained at only slightly above atmospheric pressure and at a temperature of approximately —250° F. Contrasted with this single instance, there are many thousands of tank cars and storage tanks for the handling of liquefied petroleum gases with many individual butane storage tanks up to 30,000 bbl. (168,600 cu. ft.) capacity.

The chief characteristic that differentiates the liquid fuels, such as gasoline, kerosene, and fuel oil from liquefied petroleum gases, is that their boiling points are substantially above atmospheric temperatures while the boiling points, —43.8° and 31.1° F., of propane and normal butane, respectively, are at the low range of atmospheric temperatures. This basic property imposes on the liquefied petroleum gases the necessity of requiring pressure vessels for storage, transportation, and handling in concentrated form in the liquid state. On the other hand, the low-temperature levels at which the liquefied petroleum gases vaporize make it possible to convert the liquid fuel to the gaseous state by means of low-level heat sources and often by means of atmospheric heat. At any rate, the liquefied petroleum gases once at the point of consumption are readily converted to gas of uniform composition for distribution to burners or other consuming units.

Thus, although very abundant methane has a calorific value of almost 24,000 B.t.u. per lb. and is in the gaseous form ideal for fuel purposes at points of consumption, liquefied petroleum gases are often preferred because they, unlike natural gas, can be stored and transported in concentrated liquid form at atmospheric temperatures in vessels of moderate working pressures. While natural gas must be transported in pipe line to the point of utilization or stored at a rather high cost, liquefied petroleum gases can be stored economically in quantities to meet any kind of demand that might be required.

References

1. The physical constants cited in this discussion are taken from "N.G.A.A. Physical Constants of Hydrocarbons," May 1942.
2. "The Storage of Natural Gas," by J. French Robinson. "The West Virginia Engineer," Feb. 1944.

Joe A. Hale, formerly assistant to the division manager of The Texas Co.'s Oklahoma-Kansas-Illinois producing division, with headquarters in Tulsa, has been promoted to assistant superintendent of industrial relations, with offices in Houston. He is succeeded in Tulsa by **W. B. Cooper,** who was head of the payroll section. Cooper's place is taken by **W. L. Kirkland.**

Rolf Engleman, who was district geologist for The Carter Oil Co. at Lander, Wyo., has been transferred to the company's central division, with headquarters in Oklahoma City. He succeeds **S. Willis Morse,** who resigned to enter consultant work.

John W. Schriever, who was superintendent of Gulf Oil Corp.'s refinery at Sweetwater, Tex., has been transferred to a similar post at the company's Fort Worth plant. He takes the place of **Herman Taylor,** who retired after 43 years' continuous service in the refining division. Schriever is succeeded at Sweetwater by **A. L. Giesen,** transferred from Port Arthur.

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Natural Gas

Cancellation of New Rates On Liquefied Gas

WASHINGTON. — The effective date of an order canceling proposed rates for shipments of liquefied petroleum gas in the South and Southwest has been postponed by Interstate Commerce Commission to March 19. The order, which was to have become effective February 19, was held up for a month at the request of respondent railroads.

Changes in Spacing Rules Announced by PAW

WASHINGTON. — Changes in spacing regulations for natural-gas well drilling and development operations in 42 counties of North and West Central Texas and West Central Arkansas and in San Juan County, New Mexico, have been announced by Ralph K. Davies, deputy petroleum administrator. The changes, Davies said, may not cause drilling of any additional wells, but will eliminate much paper work. Operators formerly were required to ask for exceptions to rules.

Action was taken by issuing Supplementary Order 16 to amended Petroleum Administration Order 11, which now authorizes the use of material for the drilling of gas wells in the 43 counties to a depth of 1,500 ft. on drilling units of 80 acres, to 3,500 ft. on drilling units of 160 acres, and to 5,500 ft. on drilling units of 320 acres. Previously, gas wells in these areas required a drilling unit of 640 acres regardless of depth of the well. A 640-acre unit is now required only for gas wells drilled deeper than 5,500 ft.

Carbon-Black Consumption Is Curtailed by WPB

WASHINGTON. — Reduction in carbon-black consumption to the extent of 10,000,000 lb. monthly is expected to be effected by action taken by War Production Board's rubber bureau.

"The splendid step-up in production to help meet the increased tire requirements of the armed forces has brought us face to face with an immediate critical shortage of carbon black," said James F. Clark, director of the bureau. "New facilities to produce additional carbon black are being expedited by WPB's chemicals bureau, but these are a future answer rather than a help to the shortage with us today."

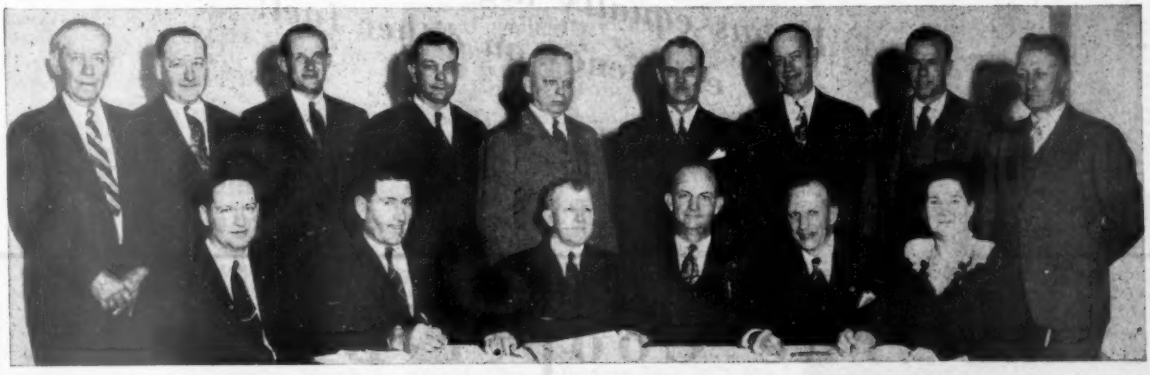
Because of extremely severe service conditions, bogie wheel tires and other rubber-covered wheels for tanks and half-tracks are excepted from restrictions. Special combat tires capable of carrying military vehicles many miles even though punctured are also excepted. Reduction in the quantity of carbon black permitted in heavy-duty truck and bus tires, tubes and tire flaps and in medium-size truck tires will amount to only 5 per cent. Reduction in passenger-car tires will be 25 per cent. Tires for jeeps must be manufactured under the same rule as passenger-car tires. Carbon black in belting, hose, packing and gaskets, as well as in mechanical goods, will be subject to general reductions. Waterproof rubber footwear and rubber-sole shoes will get along with 11 per cent less carbon black.

Unrestricted Piping of Gas From Louisiana Demanded

SHREVEPORT.—Removal by the State Minerals Board of all restrictions against exportation of natural gas from Louisiana is demanded in a resolution adopted first by the conservation committee of Caddo Parish Police Jury and then by the entire jury. The resolution was drawn up following an open hearing held by the conservation committee, of which Charles L. Horne is chairman. At a previous meeting of the jury Noah Tyson, a former police juror, had protested against appropriation of $100,000 to fight the recent ruling of FPC in the Memphis case.

J. B. Gibbs and W. F. Fulton, of United Production Co.; K. E. Jones, Great National Oil Corp., and T. C. Igoe, independent operator, were among speakers at the open hearing who urged unobstructed movement of gas to other parts of the country. Owners of gas wells, particularly in the Rodessa area, said that many of their gas wells were idle because there was no market for the product and that laws prohibiting the piping of gas from the state would be a serious detriment to further production.

"We are opposed to the creation of barriers between states," says the resolution adopted by the police jury. "We further endorse the creation of a committee to make a complete and competent study of the entire matter."



This committee recently decided to hold the Southwestern Gas Measurement Short Course at the University of Oklahoma April 17, 18 and 19. Standing—George E. Greiner, Phillips Petroleum Co.; W. R. McLaughlin, Pittsburgh Equitable Meter Co.; E. L. Stark, The Foxboro Co.; E. C. McAninch, Oklahoma Natural Gas Co.; James L. Griffin, Northern Natural Gas Co.; C. E. Terrell, Southern Natural Gas Co.; J. H. Satterwhite, American Meter Co.; B. F. Worley, United Gas Corp.; Gilbert Estill, Oklahoma Natural Gas Co. Standing—W. H. Woods, Gulf Oil Corp.; Earl Kightlinger, Arkansas Louisiana Gas Co.; C. A. Gibson, Cities Service Gas Co.; R. M. Scofield, Lone Star Gas Co.; W. H. Carson, University of Oklahoma; Kate A. Niblack, Oklahoma Utilities Association

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PIPE LINES

Shell Pipe Line Lays TXL Field Outlet

Work is going forward on the Shell Pipe Line Corp.'s new 9-mile 6-in. line from the TXL field, in West Ector County, Texas, to the company's Wheeler pump station in east Winkler County.

The new line, being built by McVean & Roberts, Odessa contractors, will handle sweet oil from the recently discovered TXL producing area. At present there is only one producer in the field, but several others are drilling, and some of them are expected to be on production shortly.

Shell representatives report that gathering lines will be laid in the field, as they are needed to collect all oil that is available.

The Shell company is engaged in replacing 16 miles of 6-in. pipe with new pipe of the same diameter along a route from a point near the town of Penwell to the Barnsley pump station in Crane County, Texas. The contractor, Swinerton & Walberg, moved equipment on the job early this week.

Texas-New Mexico Loops Are Nearly Completed

The laying of 30 miles of 12-in. loops for Texas-New Mexico Pipe Line Co. from Crane to Houston, Tex., is being brought near completion at the end of this week by the contractor, Midwestern Engineering. However, it is reported that all of the station work will not be finished until some time in April.

Gulf Completes Line From Keystone to Midland, Tex.

Construction of 63 miles of 8-in. for Gulf Refining Co. from the Ellenburger-Keystone pool to Midland, Tex., was completed by Sharman & Allen. Tests conducted over a period of several days were completed at the beginning of this week. The line will be put in service March 1 on the expiration of a contract with Magnolia Pipe Line Co. for transporting Gulf crude in the area.

Gulf Oil Corp. is preparing to take up and rearrange gas distributing and gas lift lines in the Goldsmith-Penwell areas of West Texas in connection with the program planned by the company for operating properties recently acquired from Phillips Petroleum Co. It is reported that these lines consist of various sizes which may total nearly 25 miles.

Bell Completes Fargo-Odell Line

Bell-Western Corp. has completed an extension from the Fargo pool to the new Odell pool in Wilbarger County, Texas. The new line is 4½ in. o.d. with gathering lines of the same diameter pipe. The pipe for the gathering lines is of 6.57 lb. instead of the normal weight of 11 lb. The gathering-line pipe is lapwelded, tested at 700 lb. and it is of a type which has been used for war-pipeline facilities. This is suitable for low-pressure gathering-line service where a larger diameter than customary is advantageous.

Five acres were selected on the Brooks farm in the G.C.&S.F. RR Survey, Abstract 1736, for the tank site for the tank farm and pumping station. At the present time there are six producing leases in the area. A diesel-engine reciprocating pumping unit with capacity of 175 bbl. per hour takes suction on all of these properties to pump oil into the Parker Station of the Bell Company in the Fargo pool. Tanks have not been erected as yet. Six producing wells are in this field and three additional wells are drilling. Allowable at the present time has been set on a 100-bbl.-per-day-per-well basis from the existing wells.

Ben Franklin Refining Co., wholly owned subsidiary of Bell Oil and Gas Co., has also purchased a tank and station site in Marshall County, Oklahoma, in Block 80, northwest of Cumberland, on which it has set two 1,000-bbl. tanks. A line has been constructed to these tanks into the Aylesworth pool where Ben Franklin has a gathering system. The new line is being tested and will start operation as soon as the test is completed. The gathering line into the Aylesworth field is a 3½-in. o.d. line of thin-wall pipe. The tank site is located on the road to Madill. Oil is taken from the new tank station by truck and transported to the Ben Franklin refinery at Ardmore. Three

new locations are drilling in the Aylesworth pool and Ben Franklin plans to extend its gathering system to take care of these wells in addition to those being drilled in Bryan County, Texas. Ben Franklin Company filed application for permit to lay a line from this area direct into Ardmore, Okla., and requested permission to start construction as soon as additional wells would warrant the new line, estimated length of which is approximately 33 miles. To temporarily handle this oil, the Ben Franklin Company purchased two additional trucks and has a total of four trucks now hauling the Aylesworth oil. The Aylesworth area was originally served by Central Pipe Line which sold its gathering system to the Bell interests. Most of the production adjoins Texhoma Lake. Present production in this area is approximately 600 bbl. per day.

Panhandle Eastern Project Is Considered by FPC

Hearings have been opened before Federal Power Commission to consider Panhandle Eastern Pipe Line Co.'s application for authority to increase the capacity of its facilities. Since the recent announcement that War Production Board had granted a top priority of AA-1 to this $9,000,000 project referred to as absolutely essential for continued war production, additional information has been furnished. A new 2,400-hp. compressor station will be built to serve the program for raising maximum operation pressures from 500 to 600 lb. The 32 miles of 24-in. which has been planned for delivering to Ohio Fuel Gas Co. lines will parallel Panhandle Eastern's present line in Indiana and Ohio to Muncie, Ind., and Maumee, Ohio.

In a recent statement Panhandle Eastern Pipe Line Co. reported net income for 1944 of $6,204,523, equal after preferred dividends to $6.68 a common share, against $4,340,619 or $4.33 a common share in 1943.

Arkansas House Opposes WEP 24-In. Postwar Use

The Arkansas house of representatives adopted a resolution last week by unanimous vote urging that five southwest oil production states take united action to prevent diversion of oil to the East through the big-inch pipe line after the war.

The resolution said that unrestricted flow of oil through the line after the war would drain the southwest of its resources, curtail industrial development and cause loss of taxes.

States invited to join in a move to establish a uniform severance tax or impose other restrictions are Arkansas, Louisiana, Texas, Mississippi and Oklahoma.

"We all agree that the pipe line is now making a major contribution to the war effort but after the war is over it will be a different proposition," Rep. Melvin T. Chambers said in introducing the resolution. "We will have to take some united action to hold our natural resources for our own developments."

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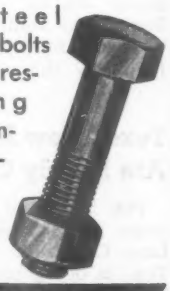

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REFINING

153,000 Tons of Butadiene Produced in 18 Months

PITTSBURGH.—More than 153,000 tons of butadiene was produced in the 18 months from July 1, 1943, to December 31, 1944, through catalytic conversion of ethyl (grain) alcohol at Kobuta, Pa., one of the three plants in the United States making butadiene from alcohol for the Government's synthetic rubber program. Four butadiene units, each with a rated annual capacity of 20,000 tons, are in operation. In January because of higher requirements for synthetic rubber and the diversion of butylenes to aviation gasoline, the units were being operated at slightly better than 160 per cent of rated capacity.

Gulf Coast Gasoline Stocks Show Moderate Decline

HOUSTON.—Stocks of all grades of gasoline and naphthas at plants in Gulf Coast Refiners Association registered a moderate increase in the second half of January, totaling 1,768,836 bbl., a rise of 184,450 compared with the stockpile on January 15. A year ago the total was 1,470,551.

Automotive gasoline stocks considered alone were 580,304 bbl. on January 31, an increase since January 15 of 26,436, but only 54 per cent of the 1,060,475 bbl. reported 2 years ago. No. 5 fuel oil increased 9,145 bbl. to 452,233 and Bunker C. increased 275,621 bbl. to 574,307. Total stocks of all products in the 11 plants of the association were reported at 3,960,563 bbl. January 31, an increase of 254,233. A year ago all products totaled 3,768,297 bbl.

Crude runs totaling 127,587 bbl. daily were 88 per cent of rated operating capacity. A year ago the group processed 103,244 bbl. a day.

Nonmilitary Lube Oils to Start for France Soon

WASHINGTON.—Shipments to France of lubricating oils for nonmilitary use will begin "within the next few weeks," in dry-cargo vessels assigned to the French by the United Nations, according to a spokesman for Foreign Economic Administration. Transportation troubles had prevented shipments hitherto, and the French have been obtaining oil products through military channels.

Only lubricating oils, of which the United States has a surplus, will be sent for the present, because they are the only large-quantity petroleum products which do not have to be sent by tanker.

"It has not yet been found practicable to release tankers for nonmilitary shipments of petroleum," it was said, "and there is no indication when the military will see fit to release any."

The FEA official said the shipments "would not affect domestic supplies materially." Petroleum Administration for War reported the nation has a surplus of bunker oils and heavy fuel oils.

FEA said it was going to try to get the oil industry to play the "greatest practicable part" in shipments to liberated areas, and it was disclosed that PAW's foreign operations committee had considered greater industry participation in supplying liberated areas.

Transportation Difficulties Increase Refinery Stocks

CHICAGO.—Transportation difficulties in the Middle West and between this region and the East are helping Midwestern refiners to accumulate inventories of some oil products. Stocks of motor gasoline are growing to such an extent that it appears probable refiners will enter the spring season in much better condition to meet the seasonal agricultural demand than they had expected. Refiners are not losing sight of the fact, however, that unless transportation troubles are remedied they will be unable to make prompt shipments to rural buyers or any others.

Tests of Lube Oils Should Include "Human Element"

CHICAGO.—Tests and investigations of lubricating oils for internal-combustion engines should include the "unscientific human element," according to N. C. Penfold and E. C. Petry, in a paper delivered last week at the first meeting of the newly organized American Society of Lubrication Engineers. They declared that laboratory-controlled field tests in vehicles simulating commercial

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operation eliminate the human element involved in commercial field tests and keep the analysis of such data within the meaning of scientific approach.

"However," the authors said, "since the unscientific human element is present in practically all ultimate applications of oil, one may recommend that it also be included in subsequent investigations.

"It appears at present that the best method is an educational program which gives the operator an appreciation for the correct use and limitations of lubricants.

"Evaluation of such oils must necessarily embrace the special problems encountered with this type of mechanism. The scope of oil testing, therefore, becomes quite comprehensive when all factors are considered.

"Growth of engine testing of lube oils indicates that at present extensive engine tests are required for their evaluation in terms of probable field performance."

Classifying oil inspection methods according to type of equipment, the authors listed: 1. Bench type tests in a chemical or mechanical laboratory. 2. Detergency or dispersancy. 3. Corrosion resistance. 4. Load-carrying ability.

Bench tests, it was asserted, do not completely correlate with laboratory or field engine results. Engine tests which have been devised furnish more pertinent crankcase-oil evaluation data, and field testing in commercial units is the ultimate in evaluation methods.

Reclamation of Oil Drums Effects Huge Savings

WASHINGTON.—More than half of the 55-gal. drums used by the Quartermaster Corps in shipping oil products during 1944 were reclaimed drums, Office of the Quartermaster General says. By this conservation measure, the Army saved the cost of new drums as well as the tons of steel and millions of man-hours required for fabrication.

Procedure for Extension of Chemical Use Simplified

WASHINGTON.—Simplified procedure in obtaining extension of authorization to use allocated chemicals is announced. A single letter may be written to War Production Board, Chemicals Bureau, Allocations Officer, Washington 25, D. C., listing all allocated chemicals and allied products for which extension is requested beyond the limit set by Order M-300, Paragraph (v) or by any other Chemicals - Bureau order.

This letter should list each material, the applicable M-300 schedule or other order, each use for which authorization has expired, the unused quantity previously authorized for that use, the original allocation period, the date the material was ordered from the supplier, the requested shipping date, the date of arrival, and the requested time extension. If a number of materials are to be used together this fact should be mentioned.

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Exploration and Drilling

Week's Highlights

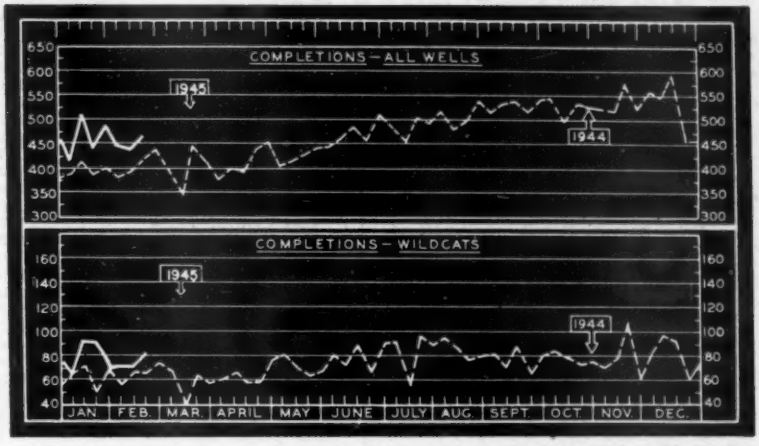
GEOLOGISTS have never underestimated the difficulties that face them in building up a picture of the pre-Permian paleogeography of West Texas and New Mexico that will serve as a useful tool in finding deeper oil fields.

There has been general agreement on the magnitude of the uplift that lies unconformably below the Permian, forming the Central Basin Platform. The large number of very prolific Permian fields found around the edges of this platform have resulted in a combination of cause and effect. The early finding of several large fields and study of the stratigraphy resulted in an understanding of the basic causes of structural oil accumulation along certain trends. With this understanding it was possible to determine where likely spots existed for other discoveries.

With Ellenburger development, the problem immediately shifts back to the same stage that once existed in early Permian exploration. It is obvious, however, that the deeper geological problems will be much greater. There is the matter of depth and cost of drilling. That means there never will be as many tests drilled to the Ellenburger as to the Permian formations, the cost is too high. To promote an Ellenburger test requires far more attractive prospects.

It is evident that Ellenburger geology is not only more complex, but also that the orders of structural magnitude are entirely different from those of the Permian. Some geologists believe that pre-Permian geology in West Texas and New Mexico will be Rocky Mountain in type. That means much more steeply folded structures, more complex faulting, and in general, large structural changes within short distances.

It is reported that one Ellenburger test shows signs that it may have drilled through an overturned structure, going back into Simpson after having drilled through a substantial section of Ellenburger. This sounds like Rocky Mountain structure, and if generally true, means that among other things, correlation of the vertical section of the Ellenburger by checking acid residues is going to be a very tricky problem.



Solid line charts current weekly completions, service wells in Eastern area included

COMPLETIONS IN ALL FIELDS . . .

Week ended February 17, 1945

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1945	1944
N. Y., Penna., W. Va.	38	17	*36	91	146,218	679	414
Ohio	7	6	3	16	44,956	90	120
Indiana	0	0	5	5	11,824	26	40
Kentucky	4	2	3	9	20,369	52	78
Illinois	19	1	8	28	79,030	244	219
Michigan	7	0	6	13	40,500	96	73
Kansas	10	2	9	21	67,578	187	230
Nebraska, Missouri, Iowa	0	0	0	0	0	6	11
Oklahoma	27	1	11	39	177,393	310	194
Texas:							
North Central	21	2	26	49	123,267	260	152
West	32	0	11	43	204,025	228	187
Panhandle	5	3	0	8	25,002	75	18
Eastern	1	4	5	10	74,923	39	39
Gulf Coast	15	3	13	31	220,447	217	68
Southwest	4	3	6	13	57,437	79	127
Total Texas	78	15	61	154	705,101	898	591
Louisiana:							
Northern	2	0	0	2	5,328	35	32
Southern	6	0	1	7	65,687	83	48
Total Louisiana	8	0	1	9	71,015	118	80
Arkansas	2	0	3	5	20,103	23	26
Mississippi	3	0	2	5	35,649	38	23
Southeastern States	0	0	1	1	4,298	3	†
Montana	2	3	1	6	13,760	38	30
Wyoming	2	0	0	2	8,078	29	14
Colorado-Utah	1	0	0	1	4,798	5	4
New Mexico	3	0	2	5	21,208	66	47
California	47	0	9	56	231,080	310	234
Total United States	258	47	161	466	1,702,958	3,218	2,419
Total previous week	245	45	157	447			
Total Feb. 19, 1944	240	35	117	392			

*Includes 32 service wells. †Included in total shown for Mississippi.

EASTERN TEXAS

Freestone County Test Gets Show of Distillate

DALLAS.—On latest perforations from 8,286-97 ft., The Texas Co. 1 McKnight, wildcat 2½ miles southwest of Fairfield, Freestone County, in the I. H. Reed Survey, made an estimated 1,500,000 cu. ft. gas in 24 hours and one bbl. distillate per hour with small amount of brackish water. The well was killed to reperforate. Total depth is 8,901 ft.

Humble Oil & Refining Co. 1 Stanley, J. Vaughn Survey, northwestern Cherokee County, after squeezing perforations from 10,172-220 ft., treated the upper Rodessa section through perforations from 9,570-9,600 ft. The well flowed 1.81 bbl. of oil, 7.37 bbl. of acid water and 100,000 cu. ft. gas through open tubing in a 12-hour test, Phillips Petroleum Co. 1 Grelling, Price Survey, ¾ mile northwest of the discovery in the South Tyler James lime pool, Smith County, was drilling below 10,197 ft. in lime. Humble 1 Pickering, Francois Survey, in the Huxley area of eastern Shelby County, was drilling below 8,046 ft. in anhydrite.

Hopkins County.—Three new tests are being staked in the Pickton area. Humble 1 W. H. Burns, 500 ft. from east of west line and 1,395 ft. north of south line of Antonio Lazarin Survey, is 1,520 ft. southwest of Humble 1 W. A. Nichols. Humble 1 R. T. King is located 645 ft. of most westerly north line and 1,260 ft. east of most southerly west line of G. W. Friddle Survey. Sun Oil Co. 1 J. M. Burns has been staked 467 ft. from south line and 3,100 ft. from west line Antonio Lazarin Survey. Humble 1 Nichols, northeast extension of the Pickton Bacon lime pool, was flowing oil plus 20 per cent wash water and mud through perforations from 7,896-7,905 ft. into the pits in an effort to clean up for a potential test. Total depth is 7,940 ft.

EASTERN TEXAS WILDCAT COMPLETIONS

Cass County: J. Simons et al 1 J. C. Frost, T. E. Tucker Sur., 3¼ mi. SE Bryan's Mill, elev. 301 ft., Pettit 6,855 ft., Travis Peak 6,979 ft., dry, TD 7,510 ft.

Harrison County: Stanolind and Continental 1 J. S. Harris, T. Gray Sur., 3 mi. SE Woodlawn, elev. 331 ft., Pettit 6,480 ft., Travis Peak 6,650 ft., dry.

Hopkins County: Sun 1 L. E. Turner, Antonio Lazarin Sur. A-549, 1½ mi. SE Pickton, elev. 512 ft., Paluxy 6,331 ft., massive anhydrite 7,796 ft., dry, TD 8,189 ft.

Leon County: A. G. Hill et al 1 A. G. Hill fee, I&GN Sur. A-987, 2½ mi. NE Jewett, elev. 522 ft., Goodland 6,400 ft., Georgetown 6,406 ft., dry, TD 6,424 ft.

Titus County: Humble 1 C. C. Searcy, W. H. Gilbert Sur., 1½ mi. S Mt. Pleasant, elev. 398 ft., Buckner 11,130 ft., Smackover 11,800 ft., dry, TD 11,835 ft.

DAILY AVERAGE PRODUCTION FOR WEEK

	Feb. 17 crude oil	Distillate, allied products	February PAW quota all oils	Feb. 10 crude oil
Alabama	250	.....	300	250
Arkansas	82,200	5,200	85,200	81,600
California	902,150	58,000	951,800	896,250
Colorado	9,850	.....	9,500	9,400
Eastern	57,500	8,700	76,900	58,050
Illinois	204,000	12,000	210,000	204,600
Indiana	12,700	.....	12,000	13,100
Kansas	271,350	5,000	279,000	252,800
Kentucky	30,900	3,800	35,800	30,200
Louisiana	363,550	37,000	397,000	357,450
North Louisiana	68,750	.....	.....	68,250
South Louisiana	294,800	.....	.....	289,200
Michigan	51,050	850	47,850	46,700
Mississippi	51,500	.....	53,000	46,800
Montana	22,300	300	23,300	22,300
Nebraska	900	.....	1,000	950
New Mexico	103,750	5,100	110,100	103,250
Oklahoma	366,300	28,500	388,500	363,550
Texas	2,146,400	150,000	2,290,000	2,141,450
East Texas	392,000	.....	.....	392,000
East Central Texas	144,200	.....	.....	144,050
North Central Texas	148,800	.....	.....	143,150
Texas Panhandle	88,000	.....	.....	88,700
West Texas	464,300	.....	.....	478,600
Southwest Texas	347,000	.....	.....	342,350
Gulf Coast	562,100	.....	.....	552,600
Wyoming	92,350	3,600	103,600	91,500
Total United States	4,769,000	318,050	5,074,850	4,722,200
Change from previous week	up 46,800			

Total production January 1-February 17, 1945 ..... 226,796,760 bbl.
Same period last year ..... 210,643,850 bbl.

SOUTHWEST TEXAS

Duval County Test Looks Like New Pool Opener

CORPUS CHRISTI.—M. M. Miller & Sons 1 George Herberger, wildcat 9 miles south of Benavides, in Duval County, recovered 2,000 ft. of oil on a 1-hour drill-stem test of Pettus sand, perforated at 5,840-52 ft., using ¼-in. choke, 38 lb. working pressure. Operators are now preparing to complete as a single sand well in the Pettus to open a new field.

Phillips Petroleum Co. 1 W. P. Bleknap, Jr., wildcat 7½ miles southeast of Kenedy, in the Chas. Haynes Survey, Karnes County, recovered 2½ bbl. of 59°-gravity condensate and 1,600,000 cu. ft. gas per day, on drill-stem test of perforations, at 7,031-35 ft., 2,475 lb. working pressure, shut in. Total depth is 8,033 ft., with 5½-in. casing at 8,028 ft.

SOUTHWEST TEXAS WILDCAT COMPLETIONS

Dimmitt County: W. J. Walton and George W. Lyles 1 Julius K. Frost, 5 mi. W of Carrizo Springs, in John Sharp Sur., dry, TD 7,002 ft.

Hidalgo County: Hamman Oil & Refg. Co. 2 John and George Hamman, San Salvador Del Tulle Grant, 2 mi. NE of Monte Christo, dry, TD 8,155 ft.

Jim Hogg County: S. F. Hurlbut and Gulf States Oil Co. 1 J. Vela Pena, Sur. 589, M. W. White subd., Blk. 10, 25 mi. S of Hebbronville, TD 3,169 ft., perforated 25 shots 3,149-55 ft., estimated 12,000,000 cu. ft. gas, open flow, tubing pressure 500 lb. Gas discovery.

McMullen County: Humble 1 E. M. Baker, M. F. Lowe Sur. 6, 17 mi. SW of George West, dry, TP 9,031 ft.

Starr County: W. W. Zimmerman & Co. 2 Mary Hedley Edgerton, Por. 80, Sh.

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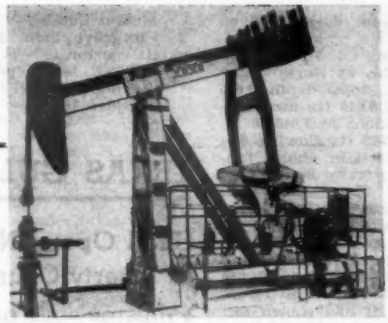

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66, Blk. 11, 10 mi. N of Rio Grande City, dry, TD 1,207 ft.

San Patricio County: Magnolia 1 Nelson heirs, I&GN Sur., 3 mi. N of Mathis, dry, TD 4,838 ft.

SOUTH LOUISIANA

Gulf Gets Good Well In St. Martin Parish

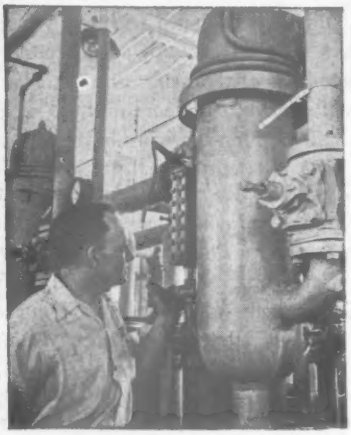
NEW ORLEANS.—Gulf Refining Co. 2-D St. Martin Land Co., 21-9s-7e, in Section 28 field, St. Martin Parish, was completed through perforations at 11,256-72 ft., flowing 403 bbl. daily through a 5/32-in. choke, tubing pressure 1,925. Total depth is 11,451 ft., with 5½-in. casing set on bottom.

Humble Oil & Refining Co. 3 M. L. Vincent, Jr. et al, 25-7s-2w, at North Tepetate in Acadia Parish, total depth 8,650 ft., with 7-in. casing at 8,649 ft., was completed through perforations at 7,846-48 ft., 2½-in. tubing set at 7,762 ft., flowing 6.54 bbl. per hour through a ⅛-in. choke, tubing pressure 1,150 lb., gravity 37°, gas-oil ratio 615 to 1.

Tide Water Associated Oil Co. et al 1 Amanda Painchard Lussier, 58-12s-14e, at Napoleonville field in Assumption Parish, is waiting on cement to set after making squeeze jobs at 10,274-76 ft. and 10,248-250 ft. Total depth is 10,982 ft., with 5½-in. casing set at 10,528 ft. It had shown salt water on test through perforations at 10,373-75 ft.

SOUTH LOUISIANA WILDCAT COMPLETION

Beauregard Parish: Magnolia 1-C Lutcher-Moore Lumber Co., discovery, West Pinegrove area, 24-5s-12w, TD 12,640 ft., perforated 24 shots 11,343-50 ft., acidized, 14 bbl. per day through 8/64-in. choke, gas-oil ratio 750 to 1, tubing pressure 185 lb.



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TEXAS GULF COAST

Shell Opens New Pool In Liberty County

HOUSTON.—Shell Oil Co., Inc. 1 Grogan Manufacturing Co. opened a new oil pool in Clayton Harper Survey, Liberty County, 3 miles southeast of the townsite of Cleveland, flowing 294 bbl. of 40.3°-gravity oil daily, with 1,700 lb. tubing pressure, 2,200 lb casing pressude, gas-oil ratio 7,070 to 1. Production is from perforations with 16 shots at 5,782-84 ft. Total depth of the hole was 12,250 ft., now plugged back to 5,785 ft.

American Republics and Houston Oil Co. of Texas added another Cockfield producer to the Beech Creek field of Hardin County at their 3 H&TC-fee, H&TC Survey. Completed through perforations at 6,272-75 ft., it flowed 394.49 bbl. of 34.3°-gravity pipe-line oil in 15 hours through a ¼-in. choke, tubing pressure 725 lb., gas-oil ratio 153 to 1. Total depth of the hole is 7,555 ft., with 5½-in. casing set to 6,570 ft. Location has been staked for 4 fee.

Navarro Oil Co. 1 Foster Lumber Co., a wildcat in George Taylor Survey, San Jacinto County, which is expected to open a new Wilcox field south of Cold Springs, is reperforating for production test in the 7,900-ft. sand. Total depth is 7,960 ft., with 5½-in. casing set on bottom. On drill-stem test through perforations at 7,905-10 ft., using 3/16-in. choke, the well flowed 5 bbl. per hour of 48°-gravity oil, tubing pressure 2,450 lb., casing pressure 2,500 lb. These perforations were squeezed to shut off excessive gas and test will be made slightly lower in the sand. Oil-water contact in the well is around 7,930 ft. Location has been staked for 2 Foster Lumber Co., which is contracted to 8,500 ft.

Tide Water Associated Oil Co. 1 Ruth G. Cobb, west extension at Satsuma field in Harris County, flowed 9 bbl. oil per hour on drill-stem test through new perforations at 6,824-26 ft., using ¼-in. and 3/16-in. chokes, 475 lb. working pressure, no water. Operators are preparing to perforate and attempt completion in the 4-ft. section at 6,822-26 ft. Total depth is 7,805 ft., with 5½-in. set at 7,103 ft.

UPPER GULF COAST TEXAS WILDCAT COMPLETIONS

Brazoria County: Gulf 2 S. M. Allen et al, Allen dome, Sterling McNeil Sur., Abstract 94, dry, TD 12,667 ft.

Colorado County: Pan American 1 R. L. Williams, West Orange Hill discovery, CTRR Surs. 662 and 663, 8 mi. W of Eagle Lake, TP 9,250 ft., perforated with 158 shots 8,368-90 ft., IP 3,156,000 cu. ft. gas daily through 17/64-in. choke.

Grimes County: C. H. Murdick 1 Myrtle Stoneham, Franklin Greenwood Sur., 2 mi. N of Stoneham, dry, TD 3,810 ft.

Jackson County: Donald W. Moore and T. J. Ahern 1 Four Way Ranch, Aldrich Sur., Blk. 91, 2 mi. E of La-Ward, dry, TD 7,008 ft.

Stewarts 1 A. E. Westhoff et al, Jos. Rector League, 1½ mi. SE of Edna, TD 6,516 ft., dual completion, perforations 5,428-40 ft., estimated 2,170,000 cu. ft. gas day, ¼-in. choke, casing pressure 2,020 lb., perforations 5,964-72 ft., 3,050,000 cu. ft. gas, ¼-in. choke, tubing pressure 2,260 lb. Discovery.

Lavaca County: Sterling Oil & Refg. Co.

1 Seekamp & Palmer, Jonathan Johnson Sur., 13 mi. SE of Yoakum, TD 8,848 ft., perforations 7,700-50 ft., 48 bbl. daily 53.8°-gravity condensate, ¼-in. choke, gas-oil ratio 40,000 to 1, tubing pressure 2,522 lb. Discovery.

Liberty County: Shell 1 Grogan Mfg. Co. et al, Clayton Harper Sur., N of Cleveland field, TD 12,250 ft., PB TD 5,785 ft., perforated with 16 holes 5,782-84 ft., IP 294 bbl. day, ¼-in. choke, gas-oil ratio 7,070 to 1, tubing pressure 1,700 lb., casing pressure 2,200 lb., 40.3° gravity, 2 per cent water. Discovery.

Wharton County: Jack W. Frazier 1 Otto Mathys, Henry Griffith Sur., 2 mi. NW of Mackey, dry, TD 6,367 ft.

PERMIAN BASIN

Andrews County Devonian Tests Look Promising

MIDLAND.—Magnolia Petroleum Co. 1 Martin, Section 13, Block A-37, Public School Land Survey, a wildcat 5 miles south of Mid-Continent Petroleum Corp. 1-7 University, the Siluro-Devonian discovery in Andrews County, took a 75-minute drill-stem test from 8,728-68 ft. and recovered 40 ft. clean oil and 200 ft. of oil and gas-cut mud. On a later 80-minute drill-stem test from 8,727-87 ft., using ⅝-in. bottom hole choke, 170 ft. of oil and gas-cut mud was recovered. It is coring ahead at 8,797 ft.

Stanolind Oil & Gas Co. 1-D University, Section 8, Block 11, University land, 4 miles west of the Embar field, total depth 10,466 ft., perforated casing in the Devonian from 8,300-50 ft. and acidized with 6,000 gallons. The well was swabbed and flowed 32 bbl. of oil in 5 hours through one-inch choke.

Shell Oil, Inc., and The Texas Co. 1 Ratliff & Bedford, southwestern Andrews wildcat, is drilling past 8,180 ft. in lime and shale. Texas Pacific 2-A Midland Farms, 1 mile west of the Mabee field, recovered tools and drilled ahead in dry lime below 4,901 ft. Union Production Co. 9 Biles is a Devonian failure on the west side of the Union Clear Fork field. After drill-stem test from 7,105-7,240 ft. it showed 3,000 ft. of drilling mud with salt water cut with gas but no showing of oil. Total depth is 8,803 ft.

Gaines County—Humble Oil & Refining 1 Humble-Shell fee, 1 mile east of the Humble 1 Doss discovery, made a 1-hour drill-stem test from 7,144-84 ft., total depth, and recovered 90 ft. of oil and 90 ft. of oil-and-gas-cut mud. Bay Petroleum Corp. 1 Humble-Cox, Section 468, Block G, CCSD&RGNG Survey, wildcat in southwestern Gaines, was preparing to perforate for test of oil staining in samples from 6,230-80 ft. Total depth is 7,184 ft. Amerada Petroleum Corp. 1-A Jones, Section 3, Block A-6, Public School Land Survey, wildcat in northwestern Gaines, is drilling lime at 4,525 ft.

Byrd-Frost, Inc., 1 Geisecke, Section 54, Block 11, H&GN Survey, 2 miles south of the Wentz pool in Pecos County, drilled ahead at 1,198 ft. in lime after passing up a slight show of gas. Humble Oil & Refining Co. 2 State National Bank of El Paso, Section 601, Carlton Survey, 2 miles northeast of Humble 1 Word, is drilling past 4,498 ft. in lime after logging small showing of gas in cores from 4,454-70 ft.

WEST TEXAS WILDCAT COMPLETIONS

Cochran County: Honolulu 1-9 R. M. Hudson, 700 ft. from SL, 1,866 ft. from WL, Sec. 9, Blk. P, PSL, 2½ mi. SW Slaughter pool, elev. 3,709 ft., plugged back to 5,125 ft., top pay 5,120 ft., San Andres 4,366 ft., pumped 111 bbl. day through 2-in. tubing, gravity 32.2, TD 5,154 ft.

Hockley County: E. Constantin, Jr., 1 Vince Dukatnik, Labor 17, League 698, State Capitol Lds., 1 mi. SE Pep, elev. 3,682 ft., dry in Clearfork, TD 6,507 ft.

Howard County: Wagner, Forrester & Harrison 1 B. F. McKenny, Sec. 42, Blk. 30, T&P Sur., 1¼ mi. NE Coahoma, elev. 2,380 gt., San Andres 2,145 ft., dry, TD 2,980 ft.

Pecos County: Magnolia 1 Hart-State, Sec. 8, Blk. 3, H&TC Sur., elev. 2,404 ft., McKee 5,559 ft., Ellenburger 6,465 ft., temporarily abandoned, TD 6,754 ft.

Upton County: Magnolia 1-A American Republics, Sec. 8, Blk. 40, T&P Sur., 27 mi. NW Rankin, elev. 2,850 ft., dry in basal Permian, TD 8,507 ft.

Scurry County: Richfield Oil 1 Dodson, Sec. 579, Blk. 97, H&TC Sur., 3 mi. NW Fluvanna, elev. 2,786 ft., dry in Clearfork, TD 3,855 ft.

Yoakum County: Honolulu Oil 1 F. A. McLane, Sec. 324, Blk. D, J. H. Gibson Sur., 9 mi. NE Plains, elev. 3,595 ft., dry in Pre-Permian, TD 8,016 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Skelly Oil Co. 2 E. L. Steeler, C NE NE 17-23s-37e, 6 miles southwest of the Gulf Oil Corp. 1 Drinkard discovery in Lea County, made a 1 hour drill-stem test in the Clear Fork section of the Permian lime from 6,137-6,210 ft. and recovered 40 ft. of gas-cut drilling mud showing some oil. A core from 6,192-6,210 ft. recovered 100 per cent pinpoint porosity and scattered bleeding and bubbling oil. The wildcat drilled from 6,210-40 ft. through scattered traces of porosity and staining. It is drilling below 6,255 ft.

The Texas Co. 1 Eaves, Lea County wildcat 14 miles north of Hobbs, in 26-16s-38e, is drilling below 5,448 ft. in lime after coring from 5,392-5,405 ft. and re-

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covering 12 ft. of tan dolomite with some oil shows. Humble Oil & Refining Co. 1 Federal-Keinath, 8-21s-38e, with plugged-back depth of 7,553 ft., swabbed 17 hours and for 11 hours recovered 100 per cent water. Later, it showed some oil on a 6-hour test, making 10 per cent oil and 90 per cent water the last hour. Testing will continue on the swab. Gulf Oil Corp. has staked location of its 1 Pike, in NE NW 6-23s-38e, 2 miles south of its 1 Vivian Drinkard discovery. Rowan Drilling Co. and Penrose, Inc. 1 Elliott, 6-22s-37e, made three flows at 3,701 ft. and showed 2,000 ft. of oil in hole before cleaning itself.

SOUTHEASTERN NEW MEXICO WILDCAT COMPLETIONS

Eddy County: H. E. Yates and Bay Pet. 1 Pearl Miller, Sec. 28-18s-31e, West Lusk area, dry, TD 2,426 ft.

Lea County: Atlantic 1 J. E. Stevens, Sec. 3-14s-33e, elev. 4,214 ft., 25 mi. NW Lovington, elev. 4,214 ft., Glorietta 5,690 ft., dry, TD 8,245 ft.

CALIFORNIA

New Pay Zone Extends Del Valle Field

LOS ANGELES.—R. E. Havenstrite 2 Liebhart has extended the Del Valle field, Los Angeles County, about 2,000 ft. southeast, by finding a new productive zone, just above the Bering zone. The well was completed flowing 400 bbl. of 58°-gravity oil and 6,000,000 cu. ft. of gas daily from 7,965-8,020 ft. The new zone apparently pinches out before it reaches the older section of the Del Valle field as a deep test at Del Valle showed the interval to be a shale member.

This is the most important development in the Del Valle field in several months. The area is badly faulted and correlation is difficult due to the sands pinching out across the field. The Del Valle anticline curves southeastward across Section 15-4n-17w and the discovery may be a new zone which will be productive only in the east end of the field.

Both Kern Oil Co. and Standard Oil Co. have missed the deep zone in the Montebello field, found by Union Oil Co. some time ago. The sand may be very limited in extent of little importance. It is possible that the new zone will extend westward or be limited to a narrow band along the axis of the structure.

In the Newhall Potero field, Barnsdall Oil Co. 44 Rancho San Francisco has set casing over the seventh Miocene zone, and will make a production test. This sand looked very good and may prove commercially productive. Barnsdall has found several additional sands in the Miocene interval but apparently failed to find the Sesnon sand of Eocene age which Standard found productive in the Aliso Canyon field some time ago. The well was drilled to 11,229 ft. and apparently was still in Miocene when drilling operations stopped

Chanslor Canfield Midway Oil Co. has taken over the abandoned wildcat of Aztec Oil Co. in the Newhall district and will deepen it in the hope of finding oil in either the Miocene or Eocene sands. Aztec Oil Co. drilled its wildcat to 7,327 ft. but in view of recent deep discoveries at Aliso Canyon and Newhall Potrero this well must be drilled to at least 10,000 ft. before it will constitute a conclusive test of the structure.

CALIFORNIA WILDCAT COMPLETIONS

Solano County, Dixon wildcat district: Amerada 1 Church, 35-5n-2e, two formation tests at 4,605-60 ft., no showings of importance, dry, TD 7,000 ft.

Los Angeles County, San Jose Hills dis-

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trict: Texas 1 Garnier, 35-1s-10w, bottomed in basement material, dry, TD 7,148 ft.

Orange County, Westminster wildcat district: W. G. Krieger 1 Miles, 14-5s-11w, dry, TD 3,000 ft.

Yolo County, Woodland wildcat district: Texas 1 Salisbury, 20-10n-1e, form. test 2,995-3,015 ft. failed after 2 minutes, recovered 225 ft. of mud and 315 ft. of muddy salt water, dry, TD 3,352 ft.

N. CENTRAL TEXAS

Young County Gets New Pool in Mississippian

WICHITA FALLS.—Maguire Industries et al 1-B B. W. King, Section 455, TE&L Co. Survey, a wildcat 6 miles northwest of Graham, Young County, has been completed in the Mississippian at 4,795 ft., flowing 331.31 bbl. of 44.2° gravity oil in 24 hours. Panhandle Refining Co. 1 A. B. Edwards, wildcat 2½ miles northwest of Scotland, Archer County, in Madison County School Lands Survey, is dry and abandoned at 5,426 ft., after a 30-minute drill-stem test from 5,384-5,426 ft. recovered 30 ft. of salty drilling mud. Panhandle 1 Cherryhomes, R. S. Gorder Survey, 2 miles south of Stewarton, Jack County, on a drill-stem test from 5,034-52 ft. recovered 200 ft. of pipe-line oil, 400 ft. of oil-cut mud with 1,600-lb. bottom-hole pressure, and is drilling ahead below 5,092 ft.

The Texas Co. 2 Gainesville National Bank, T. W. Ward Survey in Cooke County, about 12 miles northeast of Gainesville, made a 40-minute drill-stem test from 5,455-5,505 ft. and recovered 270 ft. of oil and gas-cut mud, bottom-hole pressure 850 lb., and is preparing to swab. Total depth is 5,515 ft. Kerlyn Oil Co. 1 H. C. Hay, A. C. C. Bailey Survey, wildcat 2½ miles east of Gainesville, is dry and abandoned at 4,080 ft.

NORTH CENTRAL TEXAS WILDCAT COMPLETIONS

Archer County: Fortex Oil 1 Wayne B. King, W. C. Winters Sur. A-663, 11 mi. W and 2 mi. S Archer City, elev. 1,146 ft., dry, TD 1,514 ft.

Fortex Oil et al 1 Luke McCrory, Tr., Blk. 206, ATNCL subd., 8 mi. NW Archer City, dry, TD 1,600 ft.

Gray and Seaboard 1 S. M. Gose et al, Sec. 8, ATNCL subd., 6½ mi. SW Holliday, pumped 15 bbl. day, TD 1,620 ft.

C. D. Knight and G. F. LeBus, Jr., 1 W. T. Waggoner Est., Blk. 3, H&TC Sur., 5 mi. N Dundee, dry, TD 1,680 ft.

Frank Wood et al 2 J. L. O'Keefe, Lot 32, Blk. 5, Clark & Plumb Sur., 3 mi. E and 2 mi. S Archer City, elev. 984 ft., dry, TD 1,180 ft.

Clay County: Perry Browning 1 Effie S. Willis et al, Blk. 76, Parker CSL A-374, 4 mi. S and 4 mi. E Petrolia, elev. 911 ft., dry, TD 2,002 ft.

Shappell Oil 2 Zelma Roberts, Blk. 74, Parker CSL A-374, 4 mi. S and 3 mi. E Petrolia, elev. 898 ft., dry, TD 323 ft.

Cooke County: Benson Bros. 1 Herman Danglemeyer, Francis Hughes Sur. A-439, 1½ mi. N and 3 mi. W Muensster, elev. 1,106 ft., Cambrian 3,616 ft., schist 3,872 ft., dry, TD 3,886 ft.

Grayson County: Lee Andres et al 1-A Whiting Est., Daniel Dugan Sur. No. 327, A-3, 3 mi. W Ambrose, dry, TD 3,308 ft.

Jack County: Hanlon-Buchanan, Inc. 1 J. M. Bloodworth, J. B. Irvine Sur. A-312, 6 mi. S and 5 mi. E Antelope, elev. 1,044 ft., pumped 66 bbl. day, gas-oil ratio 300 to 1, TD 3,463 ft.

Montague County: Sinclair Prairie 1 Frank Foster, Lot 179, J. H. Belcher subd., 2 mi. W and 4 mi. S Nocona, elev. 941 ft., Caddo 5,927 ft., Barnett 6,313 ft., dry, TD 6,345 ft.

Young County: Rowan Drlg. 1 P. K. Deats, Sec. 6, J. Poitevent Sur. A-2181, 2 mi. N and 5 mi. E Graham, elev. 1,186 ft., Chappell 4,772 ft., Ellenburger 5,054 ft., dry, TD 5,080 ft.

R. J. Watson et al 1 J. H. Choat, Sec. 254, TE&L Sur., 3 mi. E and ½ mi. S Orth, elev. 1,146 ft., IP 6 bbl. day, TD 620 ft.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Coleman County: Cornelius Kroll 1 W. O. Starnes, 2,780 ft. from NL, 775 ft. from EL, GH&H Sur., 5 mi. SE Coleman, elev. 1,726 ft., completed from Morris sand, top pay 2,002 ft., flowed natural 80 bbl. day through ¾-in. choke on 2-in. tubing, TP 100 lb., CP 300 lb., gas-oil ratio 1,000 to 1, gravity 43.5, TD 2,012 ft.

Wm. R. Moss, Sr. 1 Wm. R. Moss, Sr., Toyah Creek Irrigation Co., Sur. No. 70, 3 mi. NE Coleman, elev. 1,684 ft., dry in Morris section, TD 2,092 ft.

Comanche County: Kerlyn Oil Co. 1 Manes, I. Truitt Sur., 3 mi. NE Comanche, Ellenburger 2,515 ft., dry, TD 2,923 ft.

Eastland County: North Amer. Oil Consolidated 1 J. M. Gholson Est., James Lehea Sur., 1 mi. NE Ranger, elev. 1,474 ft., Caddo 3,195 ft., dry, TD 3,455 ft.

Taylor County: Lupton & McLester et al 1 Jinks McGhee and Henry James, Sec. 23, Blk. 16, T&P Sur., 4 mi. NW Abilene, elev. 1,735 ft., Flippen 2,115 ft., dry, TD 2,495 ft.

Jones County: Eltex, Ltd. 1 C. G. Smith, Sec. 4, Blind Asylum Ld., 3 mi. W Hamby, elev. 1,689 ft., Mississippi 4,808 ft., Ellenburger 4,845 ft., dry, TD 4,967 ft.

M. R. Hart 1 T. R. Putman, Sec. 1,

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C&MRR Sur., 1 mi. SW Lueders, elev. elev. 1,554 ft., dry, TD 2,247 ft.

Merry Bros. & Perini and Adler Co. 2 J. N. Herndon, Sec. 19, Blk. 2, SPRR Sur., 3½ mi. N Truby, elev. 1,728 ft., Flippen 2,383 ft., dry, TD 2,573 ft.

ROCKY MOUNTAIN

Northwest Montana Play Becoming Active

DENVER.—An interesting wildcat play in northwest Montana was indicated when B. E. Van Orsdale, of Casper, representing 57 individuals, filed applications for leases on 137,436 acres of federal land in Pondera, Teton and Lewis & Clark counties. The area which lies east of the Rocky Mountain range covers a series of overthrusts and disturbed belts in which the Mississippian overlaps Cretaceous strata, making surface geology alone impracticable. Extensive geophysical surveys during the past 3 years by a number of companies have resulted in a better knowledge of the subsurface geology. The blocks of leases run in a northwest-southeast direction from T. 28 N., R. 10 W., at the headwaters of Birch Creek, in southern Pondera County, to T. 20 N., R. 5 W., near Augusta, in Lewis & Clark County.

Union Oil Co. of California is spudding in a test near the center and just a little to the east of the disturbed area in its 1 Yeager, SE SW SE 21-24n-6w, on the Willow Creek structure. Shell Oil Co. took leases on the structure following geophysical surveys in 1937, and these recently were turned to Union. The Devonian is the principal objective and is expected at around 6,000 ft. General Petroleum Corp. has been active in leasing around this test. Carter Oil Co. and Phillips Petroleum Co. are reported leasing in the disturbed area north of the Van Orsdale blocks and nearer the Canadian border.

Texas Co. at Devon.—The Texas Co. has made two locations in the Devon area east of the Kevin-Sunburst field, to test the possibilities east and west of its recent small discovery in 1 Ekholt, NW SW NW 3-33n-1e. This well pumped 20 bbl. of oil first 24 hours after acidizing from the Madison lime at 1,651-53 ft. One location is 2 Ekholt, NW SE NW 3-33n-1e, one-third of a mile east of the discovery, and the other is 1 Weir, NW SE NE 4-33n-1e, the same distance to the west.

Second well at North Fort Collins.—Trigood Oil Co. 2 Community, SW NE NE 18-8n-68w, North Fort Collins, Larimer County, Colo., made 76 bbl. of oil per hour from the Muddy sand at a total depth of 4,798 ft. The 7-in. was set at 4,712 ft. It is a north offset to the discovery, and ran about 9 ft. higher.

Water line at Grass Creek.—Stanolind Oil & Gas Co. 29-E Meeteetse, C SE SE 13-46n-99w, Grass Creek field, drilled to 4,377 ft., and found water in the Tensleep. It was plugged back gradually and after acidizing and testing by stages was completed at 4,169 ft., swabbing 13 bbl. of fluid, 2 per cent oil, from the Embar through 116 perforations at 4,120-68 ft. It is located on the west flank about one-fourth of a mile from the nearest producer in the Embar-Tensleep.

Deep tests making progress.—Four deep tests in Rocky Mountain area are reaching interesting stages. Southern Union Production Co. 9 Barker Creek, SE SE NW 21-32n-14w, San Juan County, New Mexico, has cemented the 7-in. at 8,938 ft., in or through the Paradox formation of lower Pennsylvanian age. Texas Co.-California Co. 20 Unit, NE SW NE 34-3n-94w, Weber sand test at Wilson Creek, Rio Grande County, Colorado, is drilling at 8,143 ft. and apparently is not yet out of the red beds. General Petroleum Corp. 7 Resolute, C NW SW 8-57n-101w, Badger Basin, Wwo., is bottomed at 8,033 ft. and reaming 9-in. hole to 11 in. It is headed for the Tensleep at 12,000 ft. Carter Oil Co. 1 Bowlen, C SW NE 14-6s-19e, Fox-Luther district, Carbon County, Montana, is drilling at 8,089 ft., last reported top being the second Frontier at 4,845 ft.

OHIO, KENTUCKY

Muskingum County Gets Good Clinton Gas Well

COLUMBUS.—Atha Realty 1 E. R. Elkington, Section 8, Wayne Township, Muskingum County, gaged 4,225,000 cu. ft. in the Clinton sand. Drilling was stopped at 3,976 ft., 28 ft. in the sand, and shut in on the casing.

Pure Oil Co. has found indications of a pool in the northeast part of Perry Township, Coshocton County. Its 1 W. M. Cullison, Section 10, gaged 1,152,000 cu. ft. in the top, and 2 bbl. oil in the bottom of the Clinton sand, found at 3,110-66 ft. Two additional locations have been staked.

The Ohio Oil Co. has plugged back its sub-Trenton wildcat in Ashland County to 4,448 ft., and shot the St. Petersburg sand. After shot, the well gaged 281,000 cu. ft. with some oil and water. Total depth before plugging was 5,251 ft.

OHIO WILDCAT COMPLETIONS

Coshocton County, Perry Township: Pure 1 W. M. Cullison, Sec. 10, Clinton 3,110-66 ft., 1,152,000 cu. ft. gas, TD 3,168 ft.

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Muskingum County, Springfield Township: Industrial Gas 1 Muskingum Gravel, Sec. 17, dry, TD 3,637 ft., Clinton 3,510-61 ft., Medina 3,625-36 ft.

Tuscarawas County, Washington Township: Frank Lyons 1 Wm. Porter, Lot 37, Berea 950-1,010 ft., 2,250,000 cu. ft. Oriskany 3,460-3,470 ft., 265,000 cu. ft. TD 3,478 ft.

WESTERN KENTUCKY

OWENSBORO.—Three oil wells in Union County and a pair of wildcat dry holes were reported completed in Western Kentucky in the past week.

WESTERN KENTCKY WILDCAT COMPLETIONS

Henderson County: Sun 1-B J. Pinkston, C NE SE 19-O-22, 2½ mi. NW of Dixie, dry at 2,699 ft. Menard 1,674 ft., Barlow 2,236 ft., Ste. Genevieve 2,535 ft., upper McClosky 2,608-14 ft., lower McClosky 2,644-51 ft.

C. Wood 1 Mrs. Ann McGee, 23-Q-22, 2 mi. NW of Geneva, dry at 2,674 ft. Menard 1,657 ft., Barlow 2,222 ft., Ste-Genevieve 2,541 ft., McClosky 2,578-2,674 ft.

EASTERN KENTUCKY

ASHLAND.—Floyd, Knott and Martin counties figured in operation news in eastern Kentucky during the week ending February 14.

Two gas wells, a dry hole and one oil well completion were reported, the oil well resulting from an original gas drilling operation.

Virginia Gasoline & Oil Co. completed 1 Otto Burgess, in Martin County, at the mouth of Wolfe Creek, after well had been drilled for gas. Daily oil production was estimated at 5 bbl.

INDIANA

EVANSVILLE.—Five wells were completed in Indiana in the week in review, all of them dry. Two were wildcats.

INDIANA WILDCAT COMPLETIONS

Perry County: Sun 1 Victor Gibson, SE SE SE 17-4s-1w, dry at 3,527 ft. Top of Devonian lime 1,753 ft., Trenton lime 2,865 ft.

Posey County: Cherry & Kidd 1 Allan Gray estate, NW NW NE 28s-15w, dry at 2,879 ft. Menard 1,918 ft., Barlow 2,387 ft., Paint Creek 2,510 ft., Renard 2,601 ft., Ste. Genevieve 2,701 ft., McClosky 2,758 ft.

APPALACHIAN FIELD

OPA Ruling on Penna Grade Production in Ohio

PITTSBURGH.—Penna Grade oil producers in Ohio are protesting a ruling of the Office of Price Administration that under Paragraph "D", Section 12 of Revised Maximum Price Regulation 436, as amended by Amendment 6 by OPA that they are required to submit OPA Form 652-2170 for all Penna Grade oil wells completed since January 1, 1944. That form requires the following information: Name and location of lease and pool; date of completion; producing horizon, with depth and top of pay and bottom of formation; number of wells completed since January 1, 1944; estimated production since completion.

"The first purchaser of the crude is required to submit OPA Form 652-2170 obtained from the operator and executed in duplicate with respect to each well which commenced production after January 1, 1944.

"The amendment under which such ruling is taken is summarized "In view of the fact that separate pools located at various depths may be overlapping when considered in relation to a specific area on the surface of the land, it is possible that a well drilled to a new depth in an old field may result in flush production from a newly discovered horizon or pool. Production from such pools subsequent to Sept. 30, 1944, is not eligible for payments under Regulation 7. Therefore, with respect to new wells which commenced production subsequent to January 1, 1944, and which are located within a lease generally considered as part of a pool or area listed in Schedule "A" of Regulation 7, Defense Supplies Corporation will not give final approval to Stripper Well Compensatory Adjustment Claims covering crude produced during the month of October 1944 and subsequent months unless the corporation is informed by OPA that the new wells are part of an eligible pool or area and not part of a pool discovered since January 1, 1944."

The penalty for non-compliance falls on the First Purchaser of the crude as October, November and December 1944 claims will be paid subject to review and adjustment in accordance with determinations of OPA as to eligibility of crude from new wells. The requested forms must be received by OPA by the end of February, and if not received, payments that are in line for disbursement may be withheld pending receipt of requested statements.

The new regulation applies only to Ohio part of the Penna Grade fields. In OPA discussions before the ruling, they pointed out the irregular line of demarcation in Ohio between the Corning Grade crude and the Penna Grade with a possibility of overlapping.

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not classify the oil but depend on an agreed testing laboratory such as a refinery, Penn State College or Mellon Institute. The gathering agencies (pipe lines) certify to the DSC the amounts gathered and the amount transferred to the First Purchaser.

Unless the Petroleum Price Executive of the OPA agrees to a review of the new ruling which applies to the Ohio part of the Penna Grade area only, and rescinds it, the forecast is that later it may be made applicable to the whole area, New York, Pennsylvania and West Virginia.

During the past week in the lower eastern fields, 27 completions were reported of which 4 were dry, 20 gas wells and 3 oil producers with a daily initial of 22 bbl. Roads have now become sufficiently passable for movement of heavy hauls and drilling will be resumed at many tests which have been shut down.

MICHIGAN

Deep River-Arenac Adds 2,600-Bbl. Well

SAGINAW.—Among the 13 completions for the week, seven producers and six dry holes, was another Deep River-Arenac gusher, which flowed 2,640 bbl. potential in Section 9. The well is the Basin Oil Co.-Don Rayburn 2 Panasink. Three of the dry holes were wildcat tests.

Additional development of Michigan's principal oil field, Reed City in Osceola County, is under way, Ohio Oil Co. is completing two new wells in the field. One, on a location abandoned in 1941, in Section 20, Lincoln Township, after acidizing, flowed 675 bbl. with some salt water; the other, in Section 19, after acidizing, flowed 188 bbl. in 16 hours.

The state's first auction of oil and gas lease rights this year disposed of 17,957 acres. The land, all classed as wildcat, brought an average of 94 cents an acre, E. V. Hilliard of Mount Pleasant paying the top bid, $7.60 an acre on a 40-acre Rosecommon County tract.

Ten permits for new tests were issued during the week, two for Osceola County locations, one each for Saginaw, Gratiot, Allegan, Muskegon, Missaukee, Oceana, Arenac and Bay.

MICHIGAN WILDCAT COMPLETIONS

Allegan County, Overisel Township: Fox Hole Oil Co. 1 Harmsen, NW NE SE 29-4n-1w, dry in Traverse, TD 1,698 ft.

Rosecommon County, Rosecommon Township: Eugene Hilliard 1 Wraco Lodge, NW NE NW 11-21n-4w, dry in Dundee, TD 4,035 ft.

Tuscola County, Vassar Township: E. Edwin Brehm 1 Charlton, NE NE SE 34-11n-8e, dry in Monroe, TD 3,370 ft.

ILLINOIS

Three Wildcats Find Oil In Three Formations

CENTRALIA.—Nineteen new oil wells were added during the week in Illinois, with the unusually high average initial production of 243 bbl. per day. One large well, with an initial of 1,669, bbl. and a 720-bbl. well were mainly responsible for the high average initial output.

Pure Oil Co. 1 S. C. Rubble, SW SE SE 1-1n-7e, in the Clay City field, Wayne County, topped Rosiclare lime at 2,977 ft., but got the big pay at 3,005-14 ft., total depth 3,020 ft. Well flowed 1,760 bbl. the first 24 hours and 1,725 bbl. the second day. On its completion test it flowed 1,669 bbl.

The Bennington pool supplied the other large producer of the week, Aetna Oil Co. 1 N. VanSchoick, SE NE SW 7-1n-10e, Edwards County, which started at 740 bbl. per day from McClosky lime at 3,226-38 ft., total depth 3,243 ft.

Superior Oil Co. completed a better-than-average well in the Boyd pool in Jefferson County. No. 1 Freiderick, SW SW NE 19-1s-2e, pumped 308 bbl. initially from Benoist sand at 2,044-71 ft. and Aux Vases sand at 2,133-36 ft., total depth 2,140 ft.

Twenty-four new operations were started in the state, along with several workovers and old wells drilling deeper. The new wildcats included Pure Oil 1 J. E. Striff-A, SW SE SE 33-5n-10e, Richland County; S. C. Yingling 2 Toflett, NE SW NW 34-7s-10e, Gallatin County, and Yingling 1 J. W. Hardy, SE SE SE 5-8s-10e, Saline County; Magnolia Petroleum Co. 1 F. Stanley, SW SW NE 12-4n-8e, Clay County; Magnolia 1 T. A. Neal, SE SE SE 33-4n-4e, Marion County; Superior Oil Co. 1 R. C. Dulaney, SW SE NE 15-2s-5e, Wayne County.

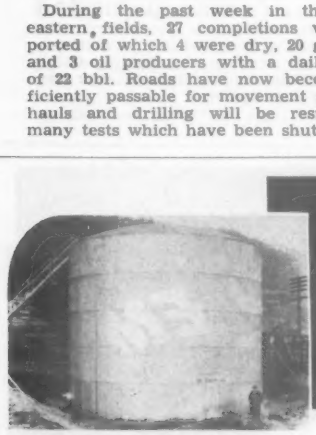
ILLINOIS WILDCAT COMPLETIONS

Edwards County: M. E. Morton et al 1 T. H. Garner, NE NE NW 28-2s-14w, McClosky lime at 3,057-65 ft., TD 3,065 ft., acidized, pumped 250 bbl. in 24 hours.

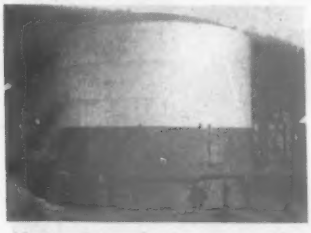
Hamilton County: Sinclair-Wyoming 3 C. Russell, NW NE NW 20-7s-5e, Aux Vases sand at 3,133-46 ft., TD, swabbed 125 bbl. in 24 hours.

Wayne County: Sohio 1 J. Tolbert, SW SW SW 27-1s-6e, dry at 3,298 ft. Upper Glen Dean 2,558 ft., Cypress 2,831 ft., Aux Vases 3,052 ft., Ste. Genevieve 3,108 ft., Fredonia 3,170 ft.

White County: New Penn 1 E. P. Hallam,



A 300,000 gallon tank before capacity-increasing work was started.



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SW NE NE 8-3s-9e, Aux Vases sand 3,374-88 ft. and Levias lime 3,431-38 ft., TD 3,522 ft., pumped 22 bbl. of oil, 8 bbl. of water through perforations, producing from both formations.

LA.-ARK.

New Pool in Prospect in Caddo Parish, Louisiana

SHREVEPORT, La.—Phillips Petroleum Co. appears to have opened a pool in Caddo Parish, Louisiana, the first discovery in 1945 in the North Louisiana area. The company's 1 Moneyham, NE NW 5-18n-16w, has been flowing by heads for more than a week, and has been given a temporary allowable of 125 bbl. per day, from the upper Travis Peak, total depth of the hole 6,065 ft. The well is on a large block along both sides of the Louisiana-Texas state line.

Two 250-bbl. wells were completed in the Delhi pool in Richland Parish.

In the Arkansas field the only completions of the week were in the Stephens-Smart field, two small producers and a third that started at 175 bbl. of oil and about 120 bbl. of water.

ARKANSAS WILDCAT COMPLETIONS

Union County: Marine Oil 1 McGough, NE NW 34-17s-13w, dry, TD 6,331 ft. Kerlyn Oil 1 Church, SW SW SE 22-19s-11w, dry, TD 4,016 ft.

OKLAHOMA

New Pools and Extensions; Phillips Buys a Block

FIFTEEN Hunton lime producers and one Bartlesville sand well were completed in the West Edmond field in Oklahoma during the week in review. The new Hunton lime wells ranged from 150 bbl. per hour down to 15 bbl. per hour, but most of them were in the larger brackets in short-time output. Peppers Gasoline Co. 2 Heidbrink, NW SE 6-13-14w, in the southwest edge of the big pool, swabbed salt water from Hunton lime through perforations at 7,018-38 ft., but was not a completion.

Fox & Fox may have connected the Lovell and southeast Lovell pools in Logan County with 1 Schmidt, C NW NW 35-18-4w, which showed a 150-bbl. production while cleaning out from Layton sand topped at 4,750 ft., total depth 4,866 ft.

Mid States Oil Corp. extended the southeast Stroud pool in Creek County with 2 Estate land, SE NW NW 18-4n-7e, which produced 331 bbl. in 15 hours, following a shot in Prue sand topped at 2,931 ft.

New pool in Stephens.—Magnolia Petroleum Co. 1 Jones heirs, C NE SE 21-1n-4w, which opened the Claud pool in eastern Stephens County, was completed in at 5,535-83 ft. and produced 174 bbl. the first 12 hours.

Amerada Petroleum Corp. et al opened another Bryan County pool with 1 Williams, NE NE SW 27-6s-7e. Pipe was perforated opposite the Bromide sand at 2,910-30 ft. and 2,965-3,005 ft. The well flowed 50 bbl. of oil in 8 hours and showed 150,000 cu. ft. of gas. Following this the crew started acidizing with 4,000 gal. Gulf and Magnolia companies have interests in the lease.

Con-Tex Petroleum Co. and Frank M. Porter 1 Wolfe, NE SW SW 34-24n-3w, Garfield County, definitely proved itself a pool opener by flowing 40 bbl. per hour from Wilcox sand at 4,833-47 ft. It flowed 75 bbl. the first hour and then flowed 40 bbl. per hour through 2½-in. tubing for 8 hours. Sinclair Prairie will lay a line to the lease which comprises 320 acres. The new pool is north of the Garber and Barnes pools.

Phillips Petroleum Co. was awarded leases on 13 tracts of land in Townships 12n-4w and 13n-4w, Oklahoma County, by the Oklahoma City council. The company's gross bid was $449,362.40 for 941.40 acres, or an average of $477.33 per acre. The leases lie between the West Edmond field and the new Bethany field and include all the municipal airport and parts of the Bluff Creek reservoir and Bluff Creek canal properties owned by Oklahoma City.

OKLAHOMA WILDCAT COMPLETIONS

Coal County: Sinclair Prairie 1 Ziegler, SW NW NW 33-3n-10w, dry, TD 1,827 ft.

Garfield County: Cities Service 1 Mariner, NW NE NW 6-22n-3w, flowed 10 bbl. in 1 hr. from pay zone 5,246-97 ft., TD 5,297 ft., Oswego 4,500 ft., Wilcox 4,886 ft., Arbuckle 5,247 ft.

Seminole County: Schermerhorn 1 Kouri, SW NW NE 13-10n-7e, dry, T.D. 3,671 ft., Wapanucka 3,640 ft., Cromwell 3,658 ft.

Stephens County: Texas 1 Bateman, SW NW NE 21-2n-8w, flowed 55 bbl. through 33/64-in. choke, gravity 32.4°, from pay zone 6,149-6,302 ft. in sand, TD 6,540 ft., Canyon lime 6,428 ft.

Tillman County: Gulf 1 Copeland, N½ NE NW 31-1s-18w, pumped 119 bbl. of 36° gravity oil from pay zone 4,568-84 ft., TD 4,670 ft., dolomite sand 4,569 ft., sand 4,585 ft., Arbuckle 4,588 ft.

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CANADIAN FIELDS

100 Bbl. Per Hour Well In N. Turner Valley

CHATHAM.—On the east side of the North Turner Valley extension, Foothills Oil & Gas 20, LSD 14, 4-21-3w5, finished at 8,568 ft. with first Madison contact at 6,763 ft. and two complete lime sequences, is making 100 bbl. per hour after acidizing the east-side lime block with 4,000 gal.

Home Millarville 18, LSD 7, 18-21-3w5, total depth 9,083 ft., Madison at 8,362 ft., is retesting with indications of a large producer.

In North-Central Turner Valley, Royalite Oil 78, LSD 2, 2-20-3w5, is testing Madison at 8,270-8,744 ft. with an initial production of 168 bbl. before acidizing.

Shallow sands.—Systematic testing of oil sands above the lime in some of the earlier South Turner Valley gas-cap wells is planned by the Mayland group. Before the Madison production was developed, light crude production was taken from the McDougall-Segur, Home and Dalhousie sands in a number of wells. Work is being commenced with Miracle 3, LSD 11, 4-19-2w5, at one time a large naphtha producer, drilled to 6,150 ft. in 1932 and which had oil shows on top of the Home sand and in the Dalhousie at 4,780 and 5,090 ft. Lime is being cemented off before perforating the Home and Dalhousie formations.

Jumping Pound.—Following the strike in Shell Exploration 4-24-J on the Jumping Pound structure west of Calgary, Shell 10-14-J has been spotted ⅝ of a mile southwest of the discovery. It is believed that as in Turner Valley, the gas cap crest found by the discovery well has oil-bearing flanks on the east and west, north and south plunges. A heavy-duty, steam-powered rotary is being moved from California for the new test.

Pekisko.—South of Turner Valley on the Pekisko structure, Ecushwa Oils 1, LSD 15, 25-16-3w5, is testing at 4,130 ft. Southeast of South Turner Valley production, Consumers Co-Operative Refinery of Regina, Sask., has located Co-Op 1 in LSD 11, 22-17-2w5, 2 miles southeast of Pekisko, with Madison lime expected at 8,250 ft.

Sullivan Creek.—On the Sullivan Creek structure southwest of Turner Valley, Phillips Petroleum 1, LSD 3, 22-18-5w5, got the Madison lime high at 1,932 ft. and is changing to rotary for deeper drilling.

Twin River.—In southern Albert, on the Twin River structure, Pacific Oil & Refinery, LSD 1, 1-2-20w4, with Devonian limestone at 5,355-5,508 ft. showed only pin-point porosity at 5,377 ft.

KANSAS

Rush County Strike Flows 100 Bbl. Per Hour

A NEW pool of possible substantial importance was opened in Rush County, 2 miles north of the Pawnee Rock pool, when Inland Oil Co. 1 Peterson, SE SE SW 35-19-16w, flowed 398 bbl. of oil from perforations at 3,725-27 ft., in the Arbuckle after a 500-gal. acid treatment.

Graham County also appears to be getting a new pool, 8 miles northwest of the Morel pool, as Helmerich & Payne, Inc., 1 Lauck, NE NE NE 13-8-22w, swabbed 30 bbl. of oil in 1 hour from Lansing pay at 3,414-38 ft., after acidizing with 1,000 gal.

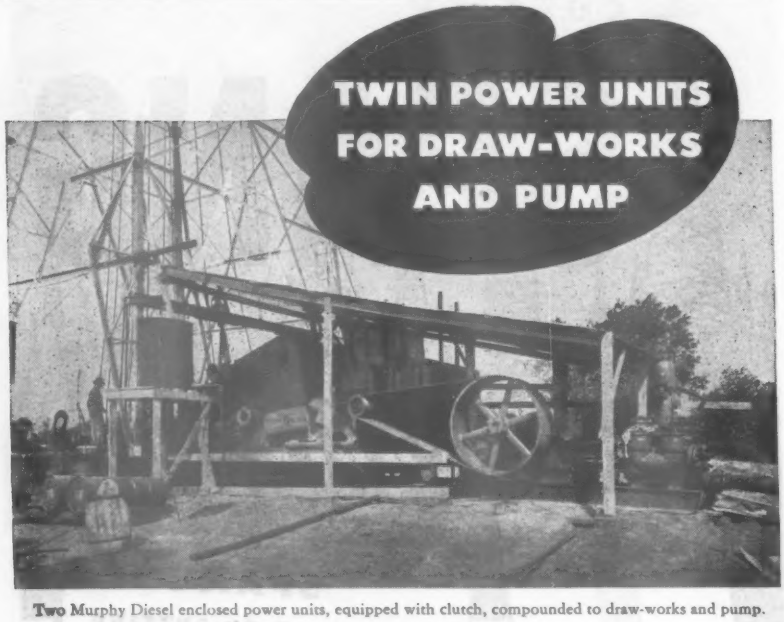
The Pawnee Rock Northeast pool in Barton County is being extended westward by Solar Oil Co. 1 Behrens, N 2 SW NE 6-20-15w. This well flowed 10 bbl. of oil per hour for 10 hours from perforations in the Arbuckle at 3,729-33 ft., after a 500-gal. acid treatment.

KANSAS WILDCAT COMPLETIONS

Finney County: Stanolind 1 Fidelity State

LEGAL

UNITED STATES DEPARTMENT OF AGRICULTURE, Forest Service, Jackson, Mississippi, February 16, 1945. Sealed bids in duplicate will be received until 10:00 A.M., Central War Time, March 19, 1945, and then publicly opened offering bonus for operating rights in connection with gas and oil leases on eight parcels of national forest land located in Scott, Lincoln, Franklin and Adams Counties, Mississippi. Parcel number one contains approximately 1,544 acres in Township 5 North, Range 6 East, Sections 22, 25, 26, 27, 35 and 36. Parcel number two contains approximately 473 acres in Township 8 North, Range 5 East, Sections 13, 14, 22, 24 and 25. Parcel number three contains approximately 201 acres in Township 8 North, Range 5 East, Section 36. Parcel number four contains approximately 2,492 acres in Township 5 North, Range 1 East, Sections 34, 35 and 36; and Township 5 North, Range 2 East, Sections 18, 19 and 31. Parcel number five contains approximately 2,451 acres in Township 5 North, Range 1 West, Sections 21, 30, 36, 54, 55 and 56. Parcel number six contains approximately 772 acres in Township 8 North, Range 5 East, Sections 9, 10, 11, 12 and 13. Parcel number seven contains approximately 2,532 acres in Township 5 North, Range 1 East, Sections 20, 21 and 22; and Township 5 North, Range 2 East, Sections 7, 8, 17 and 18. Parcel number eight contains approximately 2,404 acres in Township 6 North, Range 2 East, Sections 31, 36, 37, 41, 42 and 43. Separate bids will be received on the eight parcels. Award of lease will be made only to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms and operating regulations from the Forest Supervisor, Masonic Building, U.S. Forest Service, Jackson 114, Mississippi.



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Bank, NW 34-26-31w, dry, TD 2,955 ft., Fort Riley 2,830 ft.

McPherson County: Panhandle Eastern 1 Waltner, SE SE SE 36-21-3w, dry, TD 3,778 ft., Arbuckle 3,743 ft.

Norton County: Sinclair Prairie 1 Reed, SW SW NE 12-4-24w, dry, TD 3,869 ft., granite wash 3,834 ft.

Rice County: Plains Exploration 1 Habinger, SE NE SW 18-18-9w, dry, TD 3,225 ft., Arbuckle 3,208 ft.

Russell County: Premier Drilling 1 Hupper, SE SE NW 7-15-12w, dry, TD 3,300 ft., Arbuckle 3,279 ft.

MISSISSIPPI

Gulf Test at Soso Swabs Oil and Salt Water

JACKSON.—After failing to get anything in the basal Tuscaloosa, Gulf Refining Co. 1 Edwards-Bailey Unit, NW SE 27-10n-13w, in the Soso area of Jasper County, perforated at 7,820-23 ft., to test shows in the stringers above, and swabbed 150 bbl. per day of fluid, 50 per cent salt water, 50 per cent very heavy oil.

Wanete Oil Co. & Richard Lack 1 Craig, SW NE 32-7n-14e, Lauderdale County, is dry at 4,755 ft., after topping Tuscaloosa at 3,212 ft. Humble Oil & Refining Co. may still make a well at 1 Evans, NW NE 15-2n-16w, Marion County. Latest test at 9,127-29 ft., recovered 360 ft. 38° gravity oil, gas, and 500 ft. of brackish water. Production test was attempted but salt water broke in and perforations have been squeezed. Hassie Hunt, Trustee 1 Batson, NE SW 10-1s-14w, Pearl River County, has been abandoned at 9,074 ft. Last top reported was Eutaw at 7,113 ft. Sinclair-Wyoming Oil Co. 1 Batson, SE SE SW 20-1s-15w, also Pearl River County, is reported dry at 9,588 ft.

MISSISSIPPI WILDCAT COMPLETIONS

Lamar County: Sinclair-Wyoming 3 Newman Lumber, NE SW 5-5n-16w, elev. 415 ft., dry, TD 11,393 ft. Eutaw 8,089 ft., Marine Tulscaloosa 9,402 ft., Massive 9,717 ft., lower Cretaceous 9,928 ft.

Webster County: Webster County Oil Development Trust Co. 1 State, elev. 427 ft., NW SW SE, 15-21n-8e, dry, TD 3,545 ft.

GEORGIA WILDCAT COMPLETION

Atkinson County: Sun 1 Dost, 1,650 ft. N, 660 ft. E, SW cor. Land Lot 71, Land Dist. 7, dry, TD 4,298 ft., in basement rocks.

Puente and San Jose Hills Have Oil Possibilities

WASHINGTON.—Fifty years of exploration for oil and the drilling of at least 100 test wells have not exhausted the possibilities of finding additional supplies of oil in the Puente and San Jose Hills district in Los Angeles, San Bernardino, and Riverside counties, California, Director William E. Wrather of the Geological Survey, U. S. Department of the Interior, reported last week.

The results of a recent investigation of the stratigraphy of the region by A. O. Woodford, J. S. Shelton, and T. G. Moran have just been published by the Geological Survey. Sixteen structure sections on a scale of 1-in. = 2,000 ft. and one section on a scale of 1-in. = 500 ft., which are based on maps of the surface rock exposures and a study of the records and samples from numerous wells, show the structure and lithologic character of a granitic basement complex, the overlying rocks of Cretaceous or Eocene age, and the succeeding later Tertiary rocks.

A brief text describing the stratigraphy, structure, and oil possibilities is printed on the same sheet, and there is also a table which gives the names, locations, dates of drilling, and total depth of 83 of the wells drilled for oil in the area and an interpretation of the oldest formation penetrated by each well.

The 17 sections and the map, together with the text and list of wells, entitled, "Geology and Oil Possibilities of Puente and San Jose Hills, California," have been issued on a single sheet measuring 44 by 64 in. as Preliminary Map 23 of the oil and gas investigation series. Copies of this map may be purchased by mail, from the director of the U. S. Geological Survey, Washington 25, D. C., at 60 cents each, and copies will also then be available for "over-the-counter" sale at the survey office, 533 U. S. Post Office and Courthouse Building, Los Angeles, Calif.

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Fig. F-658

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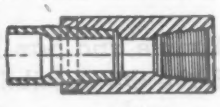

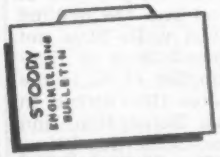

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SUMMARY OF JANUARY COMPLETIONS

	Comp.	Oil	Prod.	Gas	Dry	Under 1,000 ft.	1,000-2,500 ft.	2,500-5,000-ft.	5,000-10,000 ft.	Over 10,000 ft.	Total footage	Rigs and drilling
New York	82	41	80	0	†41	0	82	0	0	0	102,490	115
Pennsylvania	208	106	150	14	*88	0	183	25	0	0	480,406	220
West Virginia	49	4	15	39	6	0	32	17	0	0	123,464	62
Ohio	51	10	421	23	18	9	13	26	3	0	135,906	162
Indiana	15	3	412	0	12	1	10	4	0	0	32,917	38
Kentucky	38	15	1,074	7	16	3	25	10	0	0	74,646	53
Michigan	52	18	8,363	3	31	2	15	34	1	0	149,934	146
Illinois	144	85	10,814	0	59	4	47	93	0	0	330,243	180
Kansas	101	38	16,689	11	52	0	10	90	1	0	337,915	238
Neb., Mo., Iowa	6	0	0	1	5	1	1	3	1	0	21,623	9
Oklahoma	208	135	64,357	15	58	8	37	78	84	1	914,439	511
Texas:												
North Texas	131	64	18,078	3	64	25	59	26	21	0	336,754	94
West Central Texas	18	7	900	0	11	0	5	13	0	0	56,068	37
West Texas	122	90	47,794	0	23	0	17	50	51	4	654,828	526
Texas Panhandle	40	10	1,388	29	1	0	0	40	0	0	123,891	193
Eastern Texas	20	9	1,764	3	8	0	0	3	17	0	136,203	102
Upper Gulf Coast	59	32	7,295	8	19	0	1	4	47	7	438,486	123
Lower Gulf Coast	62	38	5,000	4	20	0	1	11	48	2	378,661	99
S.C. Texas (S.A.)	8	3	161	0	5	0	3	2	3	0	35,446	16
South Texas (Laredo)	37	15	1,287	2	20	1	8	19	8	1	149,744	59
Total Texas	497	277	83,667	49	171	26	94	168	195	14	2,310,081	1,249
Louisiana:												
North Louisiana	23	6	1,144	5	12	0	6	11	6	0	95,888	66
South Louisiana	48	33	6,157	1	14	0	1	0	18	29	469,664	110
Total Louisiana	71	39	7,301	6	26	0	7	11	24	29	565,552	176
Arkansas	14	7	1,485	0	7	1	1	5	7	0	68,574	27
Mississippi	29	17	2,525	0	12	0	1	4	19	5	186,002	87
Ala., Ga., Florida	2	0	0	0	2	0	0	1	1	0	10,315	14
Montana	23	16	1,161	4	3	1	11	9	2	0	55,579	106
Wyoming	20	17	8,108	0	3	0	1	11	8	0	94,712	83
Colorado, Utah	4	2	1,424	0	2	0	1	1	2	0	19,270	38
New Mexico	38	24	3,200	2	12	3	15	15	3	2	125,749	138
California	205	168	38,706	3	34	6	39	105	49	6	846,210	287
Total January	1,857	1,022	249,952	177	658	65	625	710	400	57	7,038,027	3,943
Total December	2,098	1,099	261,656	261	‡738	142	742	837	348	29	7,189,979	4,284

*Four weeks ending January 27. *Includes 87 service wells. †Includes 41 service wells. ‡Includes 143 service wells.

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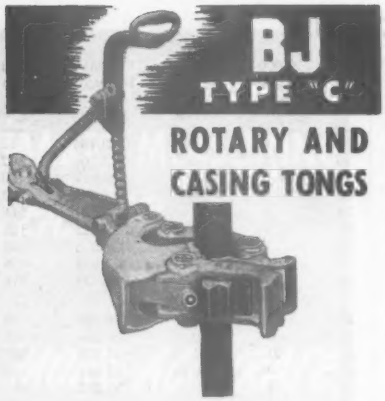

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Among the

Drilling Contractors

K. L. Kellogg, Los Angeles drilling contractor, has been awarded a contract to drill a wildcat in the Coyote district of the Los Angeles basin, and spud has already been made.

Morton & Dolley, California drilling contractors and producers, have spudded a new well for Memco Oil Co., in the Wilmington field of California. The test is scheduled to be completed in the Ranger zone.

Newell & Chandler, of Calgary, Alta., have the contract to drill the 1 Mid-Continent-East Crest, in SE¼ LSD 2, 8-6-5w4, on Hudson Bay land in the Conrad field, southern Alberta, about a mile north of the California-Standard discovery well which got production in the Ellis. The test is sponsored jointly by Mid-Continent Oil & Gas Co. and East Crest Oils, of Calgary. Light rotary will be used.

Union Drilling Co., of Calgary, has a contract with the Mayland group in Turner Valley to plug back 3 Miracle, an old naphtha well in the gas-cap area of South Turner Valley, and to gun perforate the Home and Dalhousie light-oil sands above the Madison.

Fred Summers, of Seminole, Okla., is the drilling contractor on the Nadel & Gussman and Olson Drilling Co. 2 Sandlin, in NW SE NW 1-14-9e, Creek County, Oklahoma, which was drilling under surface pipe.

Earl Wakefield, contractor on the El Dorado Refining Co. 1 Patterson, in SE SE NE 23-33-2e, Sumner County, Kansas, was making hole below surface pipe on the newly staked wildcat, which will be carried to the Bartlesville sand.

Tri-State Drilling Co. has the contract on the Alf M. Landon and Aladdin Petroleum Co. 1 Hastings, wildcat in CEL SE NE 31-30-14w, Barber County, Kansas, 2 miles east of the Sun City pool.

A local chapter of the American Association of Oilwell Drilling Contractors will shortly be organized at Oklahoma City. Decision to form such a chapter was reached at a recent district meeting held in the Oklahoma capital.

Arrow Drilling Co., contractor on the Midco Oil Co. 1 Gee, in NE NE NE 1-12-8e, Okfuskee County, Oklahoma, was drilling below 3,600 ft., and was going to the Hunton lime.

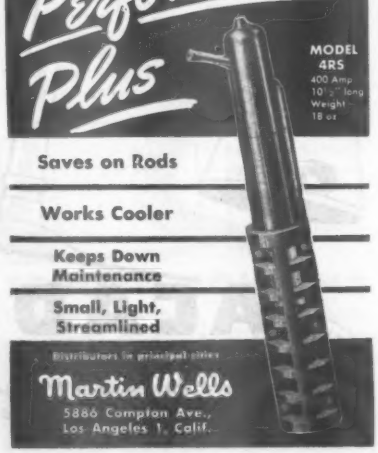
Falcon-Seaboard Drilling Co. is the contractor on the Herndon Drilling Co. 1 Mock, a wildcat in NW NW NW 25-27n-36e, Union County, New Mexico, which was drilling on at 2,605 ft.

Placid Oil Co., a subsidiary of the H. L. Hunt interests, has been given the contract to drill the D. E. and Robert J. Whelan 1 A. H. Peal, a wildcat that has been staked 1¾ miles northwest of the townsite of Harleton, in Harrison County, Texas. It is expected that the test will go to 7,500 ft.

John H. Saye, Pennville, Ind., will be the contractor on the Charles L. Gaunt 1 Fee, in SW NE 28-23n-12e, Jay County, Indiana.

Sam D. Jarvis, Evansville, Ind., contractor, will drill the Bristol Hackbush 1 Joseph E. Reis, in NE SE 24-5s-12w, Posey County, Indiana.

Electrode Holder Gives
Performance Plus



Saves on Rods
Works Cooler
Keeps Down Maintenance
Small, Light, Streamlined

Distributors in principal cities
Martin Wells
5886 Compton Ave.,
Los Angeles 1, Calif.

PENBERTHY

"REFLEX"

WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.

DETROIT, MICH. — Canadian Plant WINDSOR, ONTARIO

UNIBOLT

(TRADE MARK REGISTERED U. S. PATENT OFFICE)

THE ONE BOLT COUPLING

PARTS ARE FREELY

Interchangeable

★

THORNHILL-CRAVER CO. • HOUSTON

TUBBS

EXTRA SUPERIOR MANILA

CORDAGE COMPANY

Watch for This Trademark in Post-War Days

when you must replace rope *now*, ask your supplier for TUBBS—*always* reliable!

TUBBS CORDAGE COMPANY

Distributors

Allied Supply Co., Los Angeles

Bethlehem Supply Co., Tulsa

Clark-Wall, Inc., Los Angeles

Hickey Pipe & Supply Co., Los Angeles

MARKET QUOTATIONS

Prices as of February 20, 1945

(This service is abbreviated because most refinery products are selling at the Government's price ceilings. Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gallon.)

REFINERY GASOLINE

Octane (A.S.T.M.)	76†	70-74
Mid-Continent*	6.75	5.875
Gulf Coast	6.75	5.625
Northeast Coast	...	9.875
California	....	6.50-7.00

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	4.750	5.700
North Texas (Dist. 1 Del.)	4.500	5.400
North Texas (f.o.b. plant)	4.375	5.250
North Louisiana (Dist. 1 Del.)	5.160	6.060
North Louisiana (f.o.b. plant)	4.375	5.250
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.	
East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana	1.18
Illinois basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas	1.08

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity.	Signal Hill, Calif.	Oklahoma Kansas	Gulf Coast Texas	West Texas
18-18.9	$0.80	....	....	....
19-19.9	.84	....	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended February 10, 1945

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks *Gasoline	Distillate	Residual
East Coast	741	12,801	6,173	4,983
Appalachian	156	4,288	483	471
Ill., Ind., Ky.	765	21,746	4,264	2,495
Okla., Kan., Mo.	377	8,996	1,786	1,209
Inland Texas	235	2,889	366	667
Tex. Gulf Coast	1,190	15,586	5,815	8,256
La. Gulf Coast	271	5,010	1,460	1,428
North La., Ark.	77	2,963	805	255
Rocky Mt.	111	2,005	341	610
California	847	16,171	9,051	28,471
Total 2-10-45	4,770	92,455	30,544	48,845
Total 2- 3-45	4,662	91,034	32,370	50,451
Total 2-12-44	4,276	81,878	35,121	52,419

*Military, 44,573; civilian, 47,882.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
February 10, 1945	218,894,000
February 3, 1945	221,674,000
February 12, 1944	238,206,000

*Excludes unrefinable California stocks.

Young

DRILLING ENGINES MAKE FRIENDS FOR LIFE

If you have chosen a YOUNG Drilling Engine for the first time today, you can feel sure that the choice was a wise one. A year from today—or ten years from today, when you review your experience with this substantial, trustworthy, and economical machine, you will know how profitable your choice has been.

GAS • DIESEL • GASOLINE

YOUNG ENGINES MAKE YOUR DRILLING DOLLARS GO DEEPER

YOUNG ENGINE CORP.

CANTON OHIO

A. E. Avers, P. O. Box 606, Tulsa, Oklahoma
Iverson Tool Co., Texas, Artesia, New Mexico
Branchland Pipe & Supply Co., Huntington, W. Va.
Connelly Machy. Co., Billings & Great Falls, Mont.

OTHER YOUNG PRODUCTS

Natural Gas Carburetors • Orifice Gas Well Testers
Under-Road Boring Machines • Electric Light Plants

FOR CHANGING FORMATIONS

ZUBLIN DIFFERENTIAL BITS

Four different cutting actions directed at bottom and sides of hole. Features safety and simplicity, trouble free drilling.

See Composite Catalog or Bulletin and Prices upon request.

UNIVERSAL ENGINEERING CO.

OFFICE AND FACTORY

2369 EAST 51st ST. • LOS ANGELES 11, CALIFORNIA

BRANCHES: HOUSTON, TEXAS • LAKE CHARLES, LA.

BAKERSFIELD, VENTURA AND AVENAL, CALIFORNIA

PERSONALS

Pan American Top Assistant Job Assigned to Him

HAROLD DECKER, formerly of Corpus Christi, has joined the Pan American companies in Houston as assistant manager of the Pan American Production, Pipe Line and Gas companies and as such will serve as first assistant to E. R. Turner, vice president and general manager.

Decker was born in Chicago, December 16, 1903. He was graduated from high school at Guthrie, Okla., and attended Kenyon College at Gambier, Ohio, and the University of Oklahoma, majoring in petroleum engineering. On completion of his college work in June 1925, he was employed by the Rio Bravo Oil Co., leaving a year later to join the Marland Oil Co. as petroleum engineer, doing field and research work in Oklahoma and Kansas. From 1929 to 1930, he served as petroleum engineer for the Tidal Oil Co. in Tulsa and was then employed by the Skelly Oil Co. as petroleum engineer and subsequently as district superintendent at Seminole, Okla., and division superintendent of the Texas Gulf Coast at Houston. In 1937 he joined the Seaboard Oil Co. as district superintendent for the Gulf Coast and Southwest Texas area in charge of production, land and geology, remaining in that position until February 1945.

Decker is a member of Sigma Alpha Epsilon fraternity, A.I.M.E. and the A.P.I. and is a registered professional engineer in Texas. He is married and has a 13-year-old daughter.

William A. Argyle, Swarthmore, Pa., has been appointed associate director of the refining division of Petroleum Administration for War, in Washington. Argyle, a University of Utah graduate, formerly was assistant director, in charge of refining operations and technical processes.

John M. Kelly, formerly state geologist and secretary of the New Mexico Conservation Commission, is now superintendent of production for George P. Livermore, Inc., with headquarters in Lubbock, Tex.

J. A. Winger has resigned as assistant manager of District 2 supply and transportation committee, Petroleum Administration for War, Chicago, to return to The Texas Co. at Indianapolis as assistant manager.

Col. Freeman W. Burford, former independent oil operator in Oklahoma and Texas, has been awarded the Army Bronze Star Medal for exceptional service in handling oil-supply problems in France. He is chief petroleum officer in the communication zone.

A. L. Burch, assistant production superintendent for The Ohio Oil Co. in the Oklahoma-Kansas area, has returned to his post after an absence of about 8 months. During that time he was in charge of drilling a wildcat test near Salisbury, Md., and several tests in West Virginia and Ohio.

H. H. Kaderli has been promoted to district landman for Skelly Oil Co. in the West Texas-New Mexico district, taking the place of **H. Winston Hull,** who resigned to join Texas Gulf Producing Co. as district landman in the same area. **James R. Maedgen,** formerly Skelly scout, was promoted to Kaderli's former post.

Joseph Stevens has been advanced to general superintendent of Kern Oil Co., Ltd., with headquarters in Los Angeles. He will be in charge of all drilling and production activities in California, succeeding **George Sproule,** who retired.

Joseph W. Greybeal, Humble Oil & Refining Co., Midland, Tex., was elected president of Permian Basin Engineers Association at its annual meeting. **M. R. Hayes,** Phillips Petroleum Co., Odessa, was chosen vice president; **T. L. Speed,** West Texas Engineering Service Co., Midland, secretary-treasurer; **H. E. Legendre,** Ohio Oil Co., Midland, program chairman.

Lt. Arnold C. Dahl, formerly production superintendent for Shell Oil Co., Inc. in Illinois, has returned to the United States after 2 years with combat forces in North Africa and Italy. He has not yet been assigned a permanent duty station.

R. W. Koerting has been promoted by The Shamrock Oil & Gas Corp. from assistant superintendent to plant superintendent of the McKee plant near Dumas, Tex. **C. Allison Cash** was promoted from assistant refinery foreman to foreman at the same plant.

Morris Fisher and **Dr. Sidney Katz** have been added to the technical staff of Institute of Gas Technology, Chicago. Fisher, assigned to work on an improved method of producing carbon black, was a chemist for 8 years with U.S. Bureau of Mines at Pittsburgh. His bachelor and master of science degrees were received from Carnegie Institute of Technology. Dr. Katz, who will work in the field of gas chemistry, received his Ph.D. at McGill University, Montreal, after earning his bachelor's and master's degrees at University of Manitoba.

J. H. Thacher, Jr., has been named manager of the organization planning division, production department, of Standard Oil Co. of California. He succeeds **Gavin Witherspoon,** who was transferred to The Bahrein Petroleum Co., Ltd.

C. A. Johnson, president of Holly Development Co., was elected president of Independent Refiners Association of California at the annual meeting. **Henry Brown** was chosen first vice president; **Clifford Hancock,** of Hancock Oil Co., second vice president; **A. M. Lockhart,** secretary-treasurer. **D. B. O'Neill** was retained as general manager.

Dr. Minor C. K. Jones, of the Esso laboratories of Standard Oil Development Co., has been elected to the committee on membership of Society of Sigma Xi, national scientific honor society. Dr. Jones is a former

HOSPITABLE...
Comfortable
Convenient...

Owned and Managed by Texans

The BLACKSTONE
FORT WORTH'S HOTEL OF DISTINCTION
JOE T. O'KEEFE, President
E. B. HANNA, Manager

chairman of Esso Research Club, which in 1943 became the first industrial research group affiliated with Sigma Xi. The society was founded at Cornell University in 1886 for the encouragement of original scientific research.

Andrew G. Anderson has been appointed general traffic manager of Socony-Vacuum Oil Co., Inc., to succeed the late Louis H. Benner. He formerly was assistant traffic manager.

Robert E. Stocking, formerly geologist for District 1 of Petroleum Administration for War in Pittsburgh, has accepted a visiting professorship of geology at University of Costa Rica, San Jose.

E. J. Macfarlan, of the export department, Standard Oil Co. of California, has been elected first vice president of Foreign Trade Association of San Francisco.

L. O. Horne, construction foreman for Superior Oil Co., has been transferred from Midland, Tex., to Houston. **Sim Dunham, Jr.,** has been moved from Bakersfield, Calif., to take Horne's place in Midland.

Ralph Finklea, district superintendent for Humble Oil & Refining Co., has been transferred from the Stratton district, Kingsville, Tex., to the Willamar district, Raymondville, Tex. **John A. Diodene,** district petroleum engineer, has been transferred from the Roanoke, La., district to the Potash district, Pointe-a-la-Hache, La. **E. E. Setser,** who was district chief clerk in the Anna district, Natchez, Miss., has been moved to the La Porte district, Houston. **John C. Gill,** formerly chief clerk in Eucutta district, Waynesboro, Miss., takes Setser's place at Natchez. **B. H. C. Stover,** formerly district chief clerk in the Katy, Tex., district, succeeds Gill at Waynesboro.

Francis E. Russell, of Wichita Falls, and **Ben Graham,** of Graham, Tex., have formed a partnership as geological consultants, with their office in Graham.

CALENDAR

April 1945

I.P.A.A., midyear directors meeting. New Orleans, La., April 16-18

October 1945

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 4-6

I.P.A.A., annual membership meeting. convention city to be selected later, October 15, 16 and 17

ORBIT VALVES

MASTER VALVE
WITH
UNEQUAL FLANGES

The ORBIT GEAR OPERATED MASTER VALVE makes your Christmas Tree more compact by eliminating the use of an adapter flange—also eliminating chances for additional gasket leaks. The Unequal Flanges are cast integral with the body of the Valve.

Orbit Gear Operated Master Valve

This valve can be furnished thru all fabricators of Xmas Trees or thru any of your local supply stores at a price comparable to that of leading plug valves, YET, this valve requires no lubrication to effect a seal.

See 1944 Composite Catalog

SERVICE REPRESENTATIVES
R. G. "Bob" Cole, Houston, Texas
Phone Fairfax 0057
Warehouse 1121 Rothwell, Sect. 15, Houston
Earl F. Warren, Phone 919-W, Alice, Texas
Rex E. Galloup, Phone 6436, Lubbock, Texas

ORBIT VALVE COMPANY
TULSA, OKLAHOMA

WISCONSIN HEAVY DUTY Air-Cooled ENGINES on the job!

SALT WATER DISPOSAL!

This pair of Gould Centrifugal Pumps, direct-connected to single cylinder, and four-cylinder Wisconsin Air-Cooled Engines, are engaged in a salt water disposal pumping operation for the Ohio Oil Co., at Edmond, Okla.

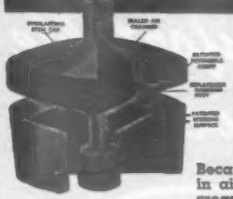
Wisconsin Engines on the job are performing dependable, heavy-duty service in various types of applications in the oil industry, as well as in many other industries. These engines have "what it takes" for continuous duty on any kind of a job within their power range. Specify "Wisconsin Air-Cooled Engine" on *your* equipment.

WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
510 Atlas Building, Tulsa, Oklahoma
M & M Building, Houston, Texas
Oil field distributors for Wisconsin Engines and all types of utility units.

For Month In - Month Out Service

USE MacCLATCHIE "AIRFLOTE" MUD PUMP VALVES



Because of the sealed-in air chamber that increases buoyancy . . . cuts liquid slippage . . . reduces impact . . . and gives more efficient valve action, MacClatchie "Airflote" Pump Valves insure superior performance and longer life under the toughest pumping conditions. Replaceable bodies, reversible inserts and everlasting stem caps give true MacClatchie economy.

The valve seats for "Airflotes" (interchangeable with MacClatchie "Streamlined" Valves) *have 20% to 100% more striking surface than others.* Plus patented cross-bar construction.

All MacClatchie Valves are guaranteed against cutting out the pump. *See your nearest representative or write direct for details on this guarantee!*

MacCLATCHIE MANUFACTURING CO.
COMPTON, CALIFORNIA

Mid-Continent Distributor:
HAKE TOOL COMPANY, Houston, Texas
Rocky Mountain Representative:
MOUNTAIN SALES & SERVICE CO., Casper, Wyoming
Foreign:
GEORGE R. WOODS, 17 Battery Place, New York, N. Y.

Guardians of Safety

JUSTRITE

Model No. 44-S

For the Petroleum Industry

Justrite safety approved lanterns and flashlights are ideal around rigs, wells, landing points, pipe-lines, or for inspection . . . in fact where safe light is needed, Justrite is just right for the job.

Justrite All-Purpose Safety Lantern

Here is the finest of portable electric lights. It has all the famous Justrite safety features including twin-bulbs with "kick-out" bulb sockets that immediately eject a broken bulb. A flick of a switch moves the reserve bulb into center position instantly. A fixed guard protects the face of the lantern and a movable guard and adjustable handle allow the light to be directed at any angle. Guards and body are strongly made of steel and guards are sparkproofed for extra safety . . . Justrite.

Approved for safety by Underwriters' Laboratories, Inc., U. S. Bureau of Mines, for safety in methane gas and air mixtures, and by the Bureau of Marine Inspection for safe use in pump rooms of tankers.

Ask your supply companies for complete information. Catalog on request.

JUSTRITE MANUFACTURING COMPANY
2063 N. Southport Avenue, Dept. G-1, Chicago 14, Illinois

The Simplex Jenny Makes Tough Pulling Jobs Easy

The Simplex Jenny Center Hole Hydraulic Puller has ample power to enable one man to pull stubborn bushings, pistons (pictured), cylinder liners, wrist pins, valve seats, keys, wheels, sprockets, gears, boiler tubes, pipes, etc. Also pushes or lifts and can be readily set up as a portable press. Bulletin 43J.

Five models; capacities 30 to 100 tons.

Simplex LEVER - SCREW - HYDRAULIC **Jacks**

Templeton, Kenly & Co.
Chicago (44), Illinois
Better, Safer Jacks Since 1899

Equipment Men in the News

Hughes Named Sales Manager Of Lane-Wells Co.

J. D. Hughes has been named sales manager of Lane-Wells Co., Los Angeles, succeeding M. E. Montrose, who has resigned as director, vice president, and manager of service and sales, according to an announcement by Walter T. Wells, chairman of the board of the company.

J. D. HUGHES

Miss B. G. Peters has resigned from the board of directors but will continue her position as secretary-treasurer with no change in duties.

Melvin H. Hass and S. M. Wagner have been elected to the board of Lane-Wells. Hass is administrative and executive assistant to the president, Adel Precision Products Corp., and Wagner is division manager, Los Angeles division, Ethyl Corp.

Air Reduction Announces New Appointments

H. F. Henriques, formerly sales manager of the north central division, Air Reduction, has been appointed general sales manager of the company. J. J. Lincoln, formerly sales manager of the south central division, has been appointed director of sales services. C. M. Bloodgood, who has been sales manager of the Pacific Coast division, is assistant to the vice president in charge of sales.

All of the above new appointees will have offices at 60 East Forty-second Street, New York.

H. P. Etter, heretofore manager of the Los Angeles district, is appointed sales manager of the Pacific Coast division with headquarters in the Mills Tower Building, San Francisco, Calif.

Boomer President of Girdler

G. O. BOOMER

George O. Boomer has been elected president of The Girdler Corp., Louisville, Ky., succeeding Walter H. Girdler, Sr., who died on January 7. He will also remain vice president and a member of the board of directors of the firm's affiliate Tube Turns, Inc.

Boomer has been a member of the board of directors of Girdler since it was founded, and executive vice president since 1938. He was formerly vice president of Ewald Iron Co. and president of the Pittsburgh Fuel Co.

Account Executive Appointed By Ostrander

Russell P. Ostrander, advertising agency of Los Angeles, Calif., has announced the appointment of R. O. Perry as senior account executive. Perry was formerly advertising manager of Emsco Derrick & Equipment Co.

Company Establishes Service Point in Venezuela

Houston Oil Field Material Co., Inc., of Houston, Tex., has recently opened a cutting and fishing-tool service point in eastern Venezuela. This branch will be centrally located at one of the drilling camps and will be under the supervision of C. G. Wheeler.

The company is offering the same cutting and fishing-tool service in South America that has been available in North America. Tools available include inside and outside cutters, "Little Inch" drill pipe for use with inside cutters, circulating and jackscrew releasing overshots, circulating and releasing spears, drills and small bits, and all auxiliary equipment needed in the operation of these tools. The Homco wire-line core-retrieving sidewall coring tool will also be available in eastern Venezuela.

Fritsch Heads Tube Turns

R. E. FRITSCH

R. E. Fritsch, vice president of Tube Turns, Louisville, Ky., since 1929, has been elected president, succeeding Walter H. Girdler, Sr., who died on January 7. He continues as vice president and a member of the board of directors of The Girdler Corp., of which Tube Turns is an affiliate.

Houston Nomads Elect Officers

The Houston chapter of Nomads elected officers for 1945 as follows: Tom W. Nelson, Gulf Publishing Co., president; W. A. Davis, Baker Oil Tools, vice president; Charles W. Thornhill, Thornhill-Craver Co., secretary and treasurer; E. L. Lorehn, Cameron Iron Works, assistant secretary and treasurer; E. F. Baldwin, Hughes Tool Co., sergeant-at-arms; Ray Doan, Coffing Hoist Co., assistant sergeant-at-arms; H. J. Craig, Baash-Ross Tool Co., past president and regent; C. W. Whitney, Baker Oil Tools, regent.

Appointed Export Representative

W. J. Campbell, president of Petroleum Machinery Corp., 30 Rockefeller Plaza, New York, has announced that his firm has been appointed to handle export sales for Aldrich Pump Co., Allentown, Pa.

Foxboro Names Melton Manager at Tulsa

The Foxboro Co., of Foxboro, Mass., announces that Wendell A. Melton has been appointed district manager, in charge of the Tulsa territory, with office in the McBirney Building.

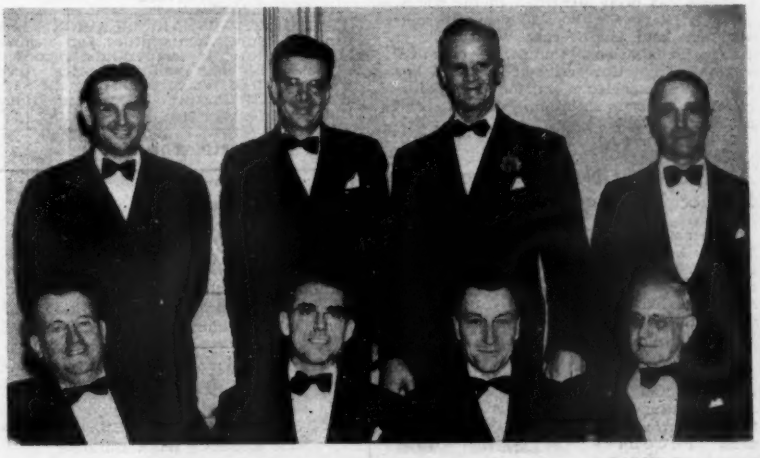
Melton has spent most of his life in Oklahoma. He was a construction and operating engineer serving oil and gas companies, and later was a consulting engineer, specializing in oil and gas work. In 1936 he was appointed business manager for the board of education of Tulsa, a position he recently resigned to join the Foxboro organization.

Firm Changes Name

The name of Rockford Drilling Machine Division of Borg-Warner Corp., at Rockford, Ill., has been changed to Rockford clutch division. The division has acquired the Borg-Warner research laboratory at Rockford and will operate it as the Rockford Clutch Engineering Laboratory.

Houston Planning Supply Row As Equipment Concern Center

A combined industrial and residential housing project, restricted to oil-field supply and equipment companies, is under way at Houston, Tex. Running from Hughes Street to Wayside Drive, and two blocks south of Harrisburg Boulevard in the city's industrial east end, Supply Row, as it is called, is on a wooded tract of 60 acres near Hughes Tool Co. and other equipment manufacturers. A portion of the tract bordering Country Club Bayou has been set aside for apartment and



Front row: W. A. (Red) Davis, Tom Nelson, H. J. Craig, and C. E. Whitney. Back row: Ray Doan, H. E. Estes, C. W. Thornhill, and E. F. Baldwin

residential development exclusively for employes of supply and equipment concerns which locate in the development.

Idea for the development was conceived by Texstream Co., first concern to locate in the project. Houston Oil Field Material Co. is presently constructing its new offices and warehouses there and other companies are expected to follow as building permits become available.

Restrictions include uniform modern architecture and construction. A central air-conditioning and heating plant is planned, and a recreation center with swimming pool and playgrounds. It is also planned to build a modern hotel and restaurant for convenience of out-of-town buyers and engineers.

Broz and Beck Named To Sales Posts

The Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, Mo., announces the appointment of Joseph G. Broz as vice president in charge of sales, and of Charles E. Beck as sales manager.

Broz formerly was sales manager of the Diesel division of Baldwin Locomotive Works, Philadelphia, Pa., and also sales manager and director of the Baldwin De La Vergne Sales Corp. Beck has been associated with sales department for the last 26 years.

Hayes-Condit Co. Formed

Announcement has been made of the formation of Hayes-Condit Co., to be located at 624 South Cheyenne, Tulsa, and

M. A. HAYES

D. J. CONDIT

headed by M. A. Hayes and D. J. Condit. The firm will serve as manufacturers' representatives in the Mid-Continent area and will provide engineering recommendations, sales, and servicing for a number of well-known equipment lines in the production, refining, and process branches of the petroleum industry.

Hayes has been identified in the southwest territory for over 20 years in construction and engineering work for refinery installations. Condit, a chemical engineer from University of Missouri, has had wide experience in the Mid-Continent in instrumentation, control, and processing work.

Air Preheater Names Tigges District Technical Adviser

Alexander J. Tigges has been appointed district technical adviser of Air Preheater Corp., with offices in New York.

For 20 years with Jackson & Moreland, Boston firm of consulting engineers, Tigges has most recently served as manager of consulting engineering for Baldwin Locomotive Works, Chester, Pa.

Classified Advertising

UNDISPLAYED RATE

6 CENTS A WORD, minimum charge $2 per insertion.
SITUATIONS WANTED, 4 cents a word, minimum charge $1.
BOX NUMBERS, count 9 words when replies are to be sent to our Tulsa Office.
10% DISCOUNT if 3 insertions are ordered at one time, with check accompanying order.

All classified advertising payable in advance.

DISPLAYED—PER INCH

Classified display advertising set in single or double column style:

1 inch	1 time	$7.00
1 inch	13 times	6.50
1 inch	26 times	6.00
1 inch	39 times	5.50
1 inch	52 times	5.00

Rates are governed by total space used within 12 months from date of first insertion. Credits are allowed when lower rates are earned.

FORMS CLOSE 9:00 A.M. MONDAY
Advertising will be accepted in order received, to extent of available space.
Published Each Saturday

FINANCING

CAPITAL SEEKERS—Interested in raising $25,000 or more for a legitimate project should write to AMSTER LEONARD, Fox Theater Bldg., Detroit 1, Mich.

WANT financial aid in developing proven and semi-proven leases with numerous offsets to drill. Have several strings of tools, pipe, etc. Box A-439, The Oil and Gas Journal, Tulsa, Oklhoma.

PATENT ATTORNEYS

PATENTS, Trade-Marks, Booklet, "General Information Concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 418, Bowen Bldg., Washington 5, D. C.

SERVICES

IMMEDIATE REPAIR SERVICE: Indicating pressure, temperature, or vacuum gages; Pressure or temperature recorders. Net costs less than half new price. Accuracy guaranteed. Valve & Instrument Service Co., 2802 Fernwood Avenue, Dallas, Texas.

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WANTED

Sales Engineer preferably with chemical or mechanical background, to represent National Distributors for guaranteed Paraffin Solvent, in Texas, Oklahoma, Louisiana, Arkansas, and Mississippi. Men with ability can earn from $600.00 to $800.00 per month, straight commission basis.

SALES-MANAGER
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HELP WANTED

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Engineering and contracting firm catering to petroleum, gas, chemical and power industries needs chemical or mechanical engineers to be responsible for complete projects from flow sheets to termination of construction. Must cooperate with process engineers, drafting room, purchasing department and construction division and aggressively coordinate work through those departments. Must be proficient in thermodynamics, instrumentation and know mechanical equipment. Salary commensurate with ability. Location, Kansas City, Missouri. Applicants must have U.S.E.S. clearance. Box A-440, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Mechanical Engineer with diesel engine and centrifugal pump experience. College graduate preferred. Essential work, permanent job, work located in Southeast. Give all details in first letter as to age, education, experience, small photograph, and salary expected. Write Box A-430, The Oil and Gas Journal, Tulsa, Oklahoma.

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Steady work, good wages water wells year round, Bucyrus machines, essential to war effort, draft exempt. Apply—Gray Well Drilling Co., Inc., Box 161, Phone 1051, Delafield, Wisconsin.

WANTED
MECHANICAL AND ELECTRICAL ENGINEER. Oilfield Equipment Manufacturer of International prominence located in Beaumont, Texas, desires to employ qualified Mechanical or Electrical Engineer to assist in the design of D.C. Electric Drilling Rigs. Good Salary, with unlimited post-war possibilities. All answers strictly confidential. Reply Box A-437, The Oil and Gas Journal, Tulsa, Okla.

Ashland Oil & Refining Company,
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WANTS
DESIGNING DRAFTSMAN

With experience in oil refinery and power plant piping, pressure vessels and heat exchangers. Independent company with completely integrated operations and a large output of 100 octane gasoline. Due to postwar program this position offers excellent opportunities for the future.

Address all correspondence to Employment Department. Applicants must comply with War Manpower Commission Regulations.

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Men interested in careers in industrial research are urged to write us giving details of training and experience. Essential work with promising postwar future offering opportunities for professional growth.

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